2005 BUILDING ENERGY EFFICIENCY STANDARDS







NONRESIDENTIAL COMPLIANCE MANUAL

CALIFORNIA ENERGY COMMISSION

COMMISSION CERTIFIED MANUAL

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extrusion manufacturer provides the mullions and frames that support the glazing and is responsible for thermal breaks. A glazing manufacturer provides the glazing units, cut to size and fabricated as insulated glass (IG) units. The glazing manufacturer is responsible for tempering or heat strengthening, the tint of the glass, any special coatings, the spacers, and the sealants. A glazing contractor (usually a subcontractor to the general contractor) puts the system together at the construction site or their shop and is responsible for many quality aspects. Predetermining the energy performance of site-built fenestration as a system is more challenging than for manufactured units.

NFRC 100 addresses the special needs of site-built fenestration products. The NFRC procedures are recommended for all site-built fenestration systems or use Table 116-A for large construction projects. Large construction projects are those that have 10,000 ft² or more of site-built fenestration, which includes windows, non-opaque doors, and skylights. The requirement is intended to apply to large office buildings and other nonresidential buildings with large curtain wall systems. Many of the costs for testing and labeling site-built glazing systems are fixed, so the cost per ft^2 is lower in larger projects. This is the primary rationale for NFRC testing and labeling.

One of the parties (architect, glazing contractor, extrusion manufacturer, IG fabricator, or glass manufacturer) must take responsibility for testing and labeling of the site-built fenestration system under the most recent NFRC 100 procedure. The responsible party must obtain an NFRC license and establish a relationship with an NFRC certified simulation laboratory, an NFRC certified testing laboratory, and an NFRC certified independent agent (IA). For more information on the licensing process, refer to the NFRC web site at http://www.nfrc.org/.

The responsible party must work with the glazing or curtain wall supplier(s) to carry out the following steps:

- Arrange for an NFRC accredited simulation laboratory to evaluate and determine the thermal performance of each product line.
- Make an arrangement with an NFRC accredited testing laboratory to conduct a validation test on each product line.
- Forward copies of the simulation and test reports to an NFRC-accredited IA for review.

The IA then issues an NFRC Label Certificate that is kept on file in the general contractor's construction office and posted on-site for review by the building inspector. The NFRC Label Certificate serves the same function as the temporary label that is required for manufactured fenestration products.

It is typical for the glazing contractor to assume responsibility for the team and to coordinate the certification and labeling process. A common procedure is for the design team to include language in the contract with the general contractor that requires that the general contractor be responsible; the general contractor typically assigns this responsibility to the glazing contractor. Once the responsible party has established a relationship with an IA, a simulation laboratory and a testing laboratory, the process works smoothly and should not delay either the design or construction process.

3. Existing glazing is removed and replaced with new site-built glazing with the same dimensions and performance specifications.

4. Existing glazing on the north façade (total area 6000 ft^2) is removed and replaced with site-built fenestration.

Answer

NFRC label certificate requirement does not apply to scenarios 1, and 2 but does apply to scenario 3.

1. Requirement does not apply because the glazing remains unchanged and in place.

2. Exception to §116(a) applies in this case (this exception applies to fenestration products removed and reinstalled as part of a building alteration or addition).

3. Use either NFRC Label Certificate or use Table 116-A default values, applies in this case as 24,000 ft^2 (more than the threshold value of 10,000 ft^2) of new fenestration is being installed.

4. Use either NFRC 100 or the applicable default U-factor set forth in Nonresidential ACM Manual Appendix NI with less than 10,000 ft^2 of site-built fenestration.

Defining Product Lines for Site-Built Fenestration

Please see NFRC Certified Products Directory and NFRC 100 Combined: Procedures for Determining Fenestration U-factors – http://www.nfrc.org.

3.3 Opaque Envelope Insulation

The requirements for opaque surfaces include both mandatory measures and prescriptive requirements.

Sloping surfaces are considered either a wall or a roof, depending on their slope (see Figure 3-11). If the surface has a slope of less than 60° from horizontal, it is considered a roof; a slope of 60° or more is a wall. This definition extends to fenestration products, including the windows in walls and any skylights in roofs.

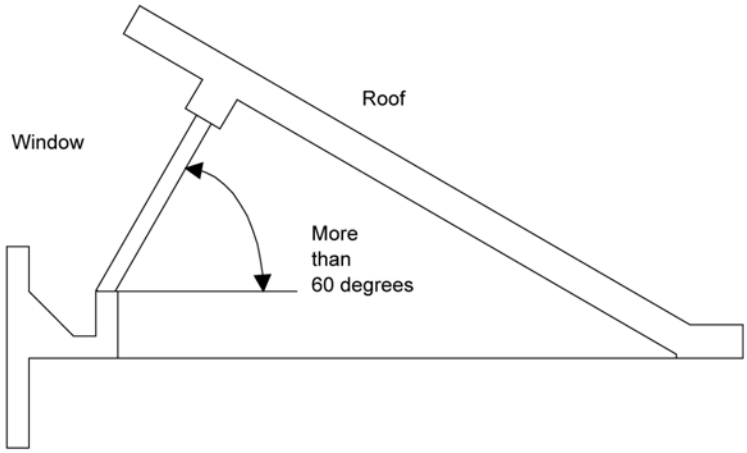


Figure 3-11 – Slope of a Wall or Window (Roof or Skylight slope is less than 60°)

The window is considered part of the wall because the slope is over 60º. Where the slope less than 60º, the glazing indicated as a window would be a skylight.

West Orientation Calculation

F. WEST DISPLAY PERIMETER – This is multiplied by 6 FT to determine the west display area for glazing limits.

G. WEST EXTERIOR WALL AREA – This is multiplied by 0.40 to determine the 40% west wall window limit for the standard design.

H. ENTER THE LARGER OF F AND G – For the Maximum Standard West Area.

I. ENTER PROPOSED WEST WINDOW AREA – The total area of windows on the west wall of the proposed building is entered here.

If the PROPOSED WEST WINDOW AREA is greater than the MAXIMUM STANDARD WEST AREA, then the envelope component method may not be used.

J. WEST WINDOW WALL RATIO – This is the PROPOSED WEST WINDOW AREA divided by the WEST EXTERIOR WALL AREA.

Skylight Area Calculation

This calculation determines whether the skylight area for the building exceeds the allowable maximum for the standard envelope.

A. ATRIUM or SKYLIGHT HEIGHT - distance from the floor to the above in FT.

B. If the height distance from the floor to the above is less than or equal to 55 FT then multiply the GROSS ROOF AREA by 5% (0.05) for the STANDARD ALLOWED SKYLIGHT AREA.

C. If the height distance is greater than 55 FT then multiply GROSS ROOF AREA by 10% (0.10) for the STANDARD ALLOWED SKYLIGHT AREA.

D. STANDARD ALLOWED SKYLIGHT AREA - The maximum allowed standard skylight area is the product of the previous two numbers.

E. PROPOSED SKYLIGHT AREA - The total area of proposed skylights shown on the plans is entered here.

Skylights

SKYLIGHT NAME - Provide a name or designator for each unique type of skylight. This designator should be used consistently throughout the plan set (roof plans, skylight schedules, etc.) to identify each skylight. It should also be consistently used on the other forms in the compliance documentation.

SKYLIGHT GLAZING - Indicate if the glazing includes a curb or not and if made out of plastic. This affects the allowed U-factor and solar heat gain coefficient.

NO. OF PANES - Indicate “2” for double glazed, “1” for single glazed skylights.

U-FACTOR - PROPOSED skylight glazing U-factor is determined as discussed in Section 3.2.5. ALLOWED U-factor is taken from Standards Tables 143-A, 143-B, or 143-C.

SOLAR HEAT GAIN COEFFICIENT - Indicate PROPOSED solar heat gain coefficient. The ALLOWED value is the maximum solar heat gain coefficient taken from the prescriptive envelope criteria in the Standards for the appropriate glazing. The value is taken from Standards Tables 143-A, 143-B, or 143-C, depending on the building occupancy type.

Relocatable Public Schools Buildings

Check the applicable box for either Specific Climate Zone(s) or Any (All) Climate Zone.

Specific Climate Zone

When the manufacturer/builder certifies that the relocatable building is manufactured for use in specific climate zones and that the relocatable building can not be lawfully used in other climate zones, the energy budget must be met for each climate zone that the manufacturer/building certifies, assuming the prescriptive envelope criteria in TABLE 143-A, including the non-north window RSHG and skylight SHGC requirements for each climate zone.

The manufacturer/builder shall meet the requirements for identification labels specified in §143 (a) 8.

Any (All) Climate Zone

When the manufacturer/builder certifies a relocatable public school building for use in any climate zone, the building must be designed and built to meet the energy budget for the most severe climate zones as specified in the Nonresidential ACM Manual, Appendix ND, assuming the prescriptive envelope criteria in TABLE 143-C.

The manufacturer/builder shall meet the requirements for identification labels specified in §143 (a) 8.

ENV-2-C Part 2 of 2

Cool Roofs

The mandatory measures require that cool roofs be tested through the Cool Roof Rating Council and labeled that liquid applied products meet minimum standards for performance and durability. Note that installing cool roofs is *not* a mandatory measure.

Check the applicable boxes either Option1: CRRC-1 Tested – Initial Thermal Emittance ≥ 0.75 and Intial Solar Reflectance ≥ 0.70 or Option 2: CRRC-1 Tested - Initial Thermal Emittance < 0.75.

Option1 compares the proposed values against the standard values. The standard values are set by the prescriptive approach. If both the proposed values are below the standard then proceed with the Option 2 method. This method is for any products that have an initial thermal emittance < 0.75. The

initial solar reflectance must be calculated given the equation $\rho_{initial} = .70 + [0.34 \text{ X } (0.75 - \varepsilon_{initial})]$.

The calculated initial solar reflectance becomes the new calculated standard.

Liquid Field Applied Coatings

There are a number of qualifying liquid products, including elastomeric coatings and white acrylic coatings. The Standards specify minimum performance and durability requirements for liquid field applied coatings. Please note that these requirements do not apply to industrial coatings that are factory-applied, such as metal roof panels. The requirements address elongation, tensile strength, permeance, and accelerated weathering. The requirements depend on the type of coating and are described in greater detail in Section 3.4.

Liquid field applied coatings must meet conditions in either Option1 or Option 2 before selecting coatings. Check the applicable box that matches the applied coating or check the "Other" and enter the name and manufacture of the roof coating. The coating must be applied with a minimum dry mil thickness of 20 mils across the entire roof surface and meet minimum requirements listed in §118(i) 3 and Table 118-C.

Opaque Surfaces

1. ASSEMBLY NAME - Provide a name or designator for each unique type of opaque surface. This designator should be used consistently throughout the plan set (elevations, finish schedules, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation.

2. TYPE - Provide the type of assembly (e.g., wood- or metal-frame wall, other floor/soffit, etc.).

3. HEAT CAPACITY - For light-weight assemblies having HC less than 7.0 (most framed assemblies), this space may be left blank. It may also be left blank for higher heat capacity assemblies, but if it is blank, the lower U-factor requirements for walls and floors/soffits with HC of 7.0 or higher may not be used.

4. INSULATION R-VALUE - This section is used for assemblies that are shown to comply by this option under the envelope component method. If the assembly U-factor option is used, this space may be left blank. The PROPOSED value is the R-value for the insulation product alone, not the total R-value for the assembly. The MIN. ALLOWED value is taken from Standards Table 143-A, 143-B, or 143-C.

5. ASSEMBLY U-FACTOR - This section is used for assemblies that are shown to comply by this option under the envelope component method. If the insulation R-value option is used, this space may be left blank. It must be consistent with the U-factor listed on the ENV-1-C, Part 2 of 2, Opaque Surfaces. The PROPOSED value is taken from tabulated values in Joint Appendix IV. The table cell reference number (column number and row number for the specified assembly and insulation) from Joint Appendix IV should be listed next to the PROPOSED value. . The MAXIMUM ALLOWED value is taken from Standards Table 143-A, 143-B, or 143-C.

Windows

1. WINDOW NAME - Provide a name or designator for each unique type of window. This designator should be used consistently throughout the plan set (elevations, window schedules, etc.) to identify each window. It should also be consistently used on the other forms in the compliance documentation.

2. ORIENTATION - Indicate orientation of each unique type of window. A window with an overhang and a similar window without an overhang would be different types. If overhangs are not used, similar windows on non-north orientations may be grouped together.

3. U-FACTOR - PROPOSED glazing U-factor is determined from ENV-1-C Part 2 of 2 Fenestration Surfaces. ALLOWED U-factor is taken from Standards Tables 143-A, 143-B, or 143-C.

4. NO. OF PANES - Indicate “2” for double glazed, “1” for single glazed windows.

5. PROPOSED RSHG – Indicate solar heat gain coefficient (SHGC), overhang factor (OHF), and the resulting RSHG.RSHG = SHGCwin x [1 + aH/V + $b(H/V)^2$]) where

H = horizontal distance from window out to bottom of overhang

V = vertical distance from bottom of window to a plane at the same height as the bottom of lower edge of overhang.

a = -0.41 for North-facing windows, -1.22 for south-facing windows, and -0.92 for east- and west-facing windows.

b = 0.20 for North-facing windows, 0.66 for south-facing windows, and 0.35 for east- and west-facing windows.

If a given window does not have an overhang, then SHGC and RSHG are the same (See Section 3.2.6).

6. ALLOWED RSHG - The maximum relative solar heat gain allowed, taken from Standards Tables 143-A, 143-B, or 143-C for the appropriate window orientation (north or non-north).

3.10.3 ENV-3-C: Overall Envelope Method

This compliance worksheet should be used only when the envelope is shown to comply using the overall envelope method.

1. PROJECT NAME is the title of the project, as shown on the plans, on the ENV-1-C, and known to the building department.

2. DATE is the date of preparation of the compliance submittal package. It should be on or after the date of the plans, and on or before the date of the building permit application.

ENV-3-C Part 1 of 7

The first part of this form involves tests of glazing area for windows and skylights. If either of these tests does not pass, then the glazing area and associated wall area must be adjusted for the standard envelope.

Window Area Calculation

A. DISPLAY PERIMETER - This is multiplied by 6 FT to determine the DISPLAY AREA for glazing limits.

B. GROSS EXTERIOR WALL AREA -This is multiplied by 0.40 to determine the 40% of the Gross Exterior Wall Area for glazing limits.

C. Enter the Larger of A or B for the MAXIMUM STANDARD AREA.

D. PROPOSED WINDOW AREA - The total area of proposed windows shown on the plans is entered here.

If the PROPOSED WINDOW AREA is greater than the MAXIMUM STANDARD AREA, then the envelope component method may not be used.

E. WINDOW WALL RATIO – Proposed window area divided by gross exterior wall area.

West Orientation Calculation

F. WEST DISPLAY PERIMETER – This is multiplied by 6 FT to determine the west display area for glazing limits.

G. WEST EXTERIOR WALL AREA – This is multiplied by 0.40 to determine the 40% west wall window limit for the standard design.

H. ENTER THE LARGER OF F AND G – For the Maximum Standard West Area.

I. ENTER PROPOSED WEST WINDOW AREA – The total area of windows on the west wall of the proposed building is entered here.

If the PROPOSED WEST WINDOW AREA is greater than the MAXIMUM STANDARD WEST AREA then the envelope component method may not be used.

J. WEST WINDOW WALL RATIO – This is the PROPOSED WEST WINDOW AREA divided by the WEST EXTERIOR WALL AREA.

Combined Values for North East and South Walls

K. N/E/S DISPLAY PERIMETER – This is the DISPLAY PERIMETER (Box A) minus the WEST PERIMETER (Box F). The result is multiplied by 6.

L. N/E/S EXTERIOR WALL AREA – This is the GROSS EXTERIOR WALL AREA (Box B) minus the WEST EXTERIOR WALL AREA (Box G). The result is multiplied by 0.40.

M. Enter the larger of K or L.

N. PROPOSED N/E/S WINDOW AREA – This is the PROPOSED WINDOW AREA (Box D) minus the PROPOSED WEST WINDOW AREA (Box I).

O. If D is greater than C, calculate 1 or 2 below, otherwise place a check mark in the box labeled “Check IF NOT APPICABLE” on the Window area adjustment calculations portion of Part 7.

1. If I is less than H, divide the MAXIMUM STANDARD AREA (Box C) by the PROPOSED WINDOW AREA (Box D) and enter the result into the WEST WINDOW ADJUSTMENT FACTOR box; otherwise enter a 1.0 in this box.

2. If I is greater than H, Calculate a. and b. below

a. Divide MAXIMUM STANDARD WEST AREA (Box H) by the PROPOSED WEST AREA (Box I) and enter into the box for WEST WINDOW ADJUSTMENT FACTOR (WAF_w).

b. Divide MAXIMUM STANDARD N/E/S AREA (Box M) by PROPOSED N/E/S AREA and enter result into box for N/E/S WINDOW ADJUSTMENT FACTOR (WAF_{nes}).

The WINDOW ADJUSTMENT FACTOR numbers are carried to Part 7 of the form to calculate the adjusted window and wall areas. Upon completion of those calculations, Part 3, Part 4, and Part 6 may be completed.

ENV-3-C Part 2 of 7 Skylight Area Calculation

A. ATRIUM or SKYLIGHT HEIGHT distance from the floor to the ceiling in FT.

B. If the height distance from the floor to the ceiling is less than or equal to 55 FT then multiply the GROSS ROOF AREA by 5% (0.05) for the STANDARD ALLOWED SKYLIGHT AREA.

C. If the height distance is greater than 55 FT then multiply GROSS ROOF AREA by 10% (0.10) for the STANDARD ALLOWED SKYLIGHT AREA.

STANDARD ALLOWED SKYLIGHT AREA - The maximum allowed standard skylight area is the product of the previous two numbers.

D. PROPOSED SKYLIGHT AREA - The total area of proposed skylights shown on the plans is entered here.

1. If the PROPOSED SKYLIGHT AREA is greater than or equal to the STANDARD SKYLIGHT AREA, then divide STANDARD SKYLIGHT AREA by PROPOSED SKYLIGHT AREA and enter result into box for SKYLIGHT ADJUSTMENT FACTOR. Otherwise enter 1.0 in the box for SKYLIGHT ADJUSTMENT FACTOR, the skylight calculations on Part 3, Part 4, and Part 6 can be done without the adjusted skylight or roof areas.

The SKYLIGHT ADJUSTMENT FACTOR is carried to Part 7 of the form to calculate the adjusted skylight and roof areas. Upon completion of those calculations, Parts 3 through 6 may be completed.

ENV-3-C Part 3 of 7 Overall Heat Loss

This form should be used to confirm that the proposed envelope design has an overall heat loss no greater than the standard heat loss for the building.

Overall Heat Loss

A. ASSEMBLY NAME - Provide a name or designator for each unique type of surface under the appropriate heading (e.g., WALLS, ROOFS/ CEILINGS, etc.). Demising walls are not to be included in this calculation. This designator should be used consistently throughout the plan set (elevations, finish schedules, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation. For windows and skylights, list the number of panes of glazing; indicate “2” for double-glazed, “1” for single glazed-windows.

Proposed

B. PROPOSED AREA - Enter the actual area, in ft^2, of each assembly. Refer to Joint Appendix I for definitions by type of assembly.

C. PROPOSED HEAT CAPACITY - See Section 3.3.2 and Joint Appendix IV for discussion of how this value is determined. For light weight assemblies having HC less than 7.0 (most framed assemblies), this space may be left blank. It may also be left blank for higher heat capacity assemblies, but if it is blank then the lower U-factor requirements for walls and floors/soffits with HC of 7.0 or higher may not be used.

D. PROPOSED U-FACTOR - Enter the U-factor of the proposed assembly as designed. U-factors are taken from tabulated values in the Joint Appendix IV. The corresponding table cell reference number from Joint Appendix IV should be listed in the next column. U-factors for windows and skylights are from ENV-1-C Part 2 of 2

Note: For Wet Insulation Systems on exterior roofs in Climate Zones 1and 16, the insulating R-value of continuous insulation materials installed above the roof waterproof membrane must be multiplied by 0.8 before choosing the table column for determining assembly U-factor. See the footnotes for Tables IV.1 through IV.7 in the Joint Appendices.

JOINT APPENDIX IV REFERENCE – List the cell table reference for the proposed assembly (e.g. table cell reference is IV.9 C25).The reference number indicates the Joint Appendix IV table number, column number, and row number for the specified assembly and insulation.

E. PROPOSED UA - The numbers in columns B and D are multiplied together and the result entered in this column.

Standard

F. STANDARD AREA - If no window or skylight area adjustments are required (as demonstrated on Part 1 of 7), then the STANDARD AREA is the same as the PROPOSED AREA for each assembly. If adjustments are required, then the adjusted areas of window, wall, skylight and roof are taken from Part 7 of 7.

G. STANDARD U-FACTOR - Enter the U-factor for each assembly type, taken from Standards Tables 143-A, 143-B, or 143-C.

H. STANDARD UA - The numbers in COLUMNS F and G are multiplied together and the result entered in this column.

COLUMNS E and H are totaled at the bottom of the page and the results compared. If the COLUMN E total is no greater than the COLUMN H total, then the overall heat loss requirement has been met.

ENV-3-C Part 4 of 7 Overall Heat Gain from Conduction

The heat gain subtotals from Parts 4 and 5 are added to the subtotal on Part 6 to determine the total standard building heat gain and proposed building heat gain. Part 4 deals with the conduction heat gain through the building envelope.

A. ASSEMBLY NAME - Provide a name or designator for each unique type of surface under the appropriate heading (WALLS, ROOFS/ CEILINGS, etc.). Demising walls are not to be included in this calculation. This designator should be used consistently throughout the plan set (elevations, finish schedules, etc.) to identify each surface. It should also be consistently used on the other forms

in the compliance documentation. For windows and skylights, list the number of panes of glazing; indicate “2” for double-glazed, “1” for single-glazed windows.

Proposed

B. PROPOSED AREA - Enter the actual area, in ft^2, of each assembly.

C. TEMPERATURE FACTOR - Enter the temperature factor based on the envelope type and Climate Zone from Standards Table 143-D.

D. PROPOSED HEAT CAPACITY - See Section 3.3.2 and Joint Appendix IV for discussion of how this value is determined. For light weight assemblies having HC less than 7.0 (most framed assemblies), this space may be left blank. It may also be left blank for higher heat capacity assemblies, but if it is blank then the lower U-factor requirements for walls and floors/soffits with HC of 7.0 or higher may not be used.

E. PROPOSED U-FACTOR - Enter the U-factor of the proposed assembly as designed. U-factors are taken from tabulated values in the Joint Appendix IV. The corresponding table cell reference number from Joint Appendix IV should be listed in the next column. U-factors for windows and skylights are from ENV-1-C Part 2 of 2

Note: For Wet Insulation Systems on exterior roofs in Climate Zones 1and 16, the insulating R-value of continuous insulation materials installed above the roof waterproof membrane shall be multiplied times 0.8 before choosing the table column for determining assembly U-factor. See the footnotes for Tables IV.1 through IV.7 in the Joint Appendices.

JOINT APPENDIX IV REFERENCE – List the cell table reference for the proposed assembly (e.g. table cell reference is IV.9 C25).The reference number indicates the Joint Appendix IV table number, column and row for the specified assembly and insulation.

F. HEAT GAIN - The numbers in COLUMNS B, C, and E are multiplied together and the result entered in this column. The result is a heat gain in Btu/h for that building component.

Standard

G. STANDARD AREA - If no window or skylight area adjustments are required (as demonstrated on Part 1 of 7), then the STANDARD AREA is the same as the PROPOSED AREA for each window and skylight. If adjustments are required, then the adjusted areas are taken from Part 7 of 7.

H. STANDARD U-FACTOR - Enter the U-factor for each assembly type, taken from Standards Tables 143-A, 143-B, or 143-C of the Standards for the appropriate climate zone.

I. TEMPERATURE FACTOR - Enter the temperature factor based on the envelope type and climate zone from Table 143-D of the Standards (same as C).

J. HEAT GAIN - The numbers in COLUMNS G, H, and I are multiplied together and the result entered in this column.

Columns F and J are totaled. These subtotals are entered under ‘Part 6 Subtotal’ in COLUMNS I and M of ENV-3-C Part 6 of 7.

ENV-3-C Part 5 of 7 Overall Heat Gain from Radiation

This part of the form is used to calculate the heat gain due to solar radiation absorbed by the roof for the standard and proposed building envelopes.

Roof Absorptance Calculation

This section determines the roof absorption value for the proposed building. A cool roof certified by the CRRC-1 rating procedure is now required for low-sloped nonresidential buildings.

Case 1 Proposed

1. CRRC-1 Certified? Select *Yes* if the proposed roof has been certified and go to step 2, or if you selected *No* then go to step 8.

2. Is the initial thermal emittance ≥0.75? If yes then go to step 3, or if *No* then go to step 5.

3. Enter the initial reflectance value from CRRC then go to step 4 and insert the value in the equation and calculate.

4. Calculate the proposed absorption and enter the result in Column F.

Case 2 CRRC-1 Tested – Proposed

5. Enter the CRRC initial reflectance and emittance values, go to step 6, enter the values in the equation, and calculate the proposed reflectance.

6. Calculate the proposed reflectance, go to step 7, and enter the value into equation and calculate.

7. Calculate the proposed absorption and enter the results in Column F.

Case 3 Not CRRC-1 Tested – Proposed Default

8. Is the roof a nonresidential low-slope? If yes, the proposed default absorption value is 0.87; if not use 0.73. Enter the value in Column F.

Standard Absorptance Values

When tested in accordance with CRRC-1 - The standard absorptance values α_{std} for Column J are either 0.45 for nonresidential low-sloped roofs or 0.73 for nonresidential high-sloped roofs. The standard absorptance is based on the initial solar reflectance of 0.70 for nonresidential low-sloped roofs and 0.30 for nonresidential high-sloped roofs. See Standards Equation 143-D.

Overall Heat Gain Radiation for Roofs

A. ASSEMBLY NAME - Provide a name or designator for each unique type of roof surface (e.g., Roof-1, Roof-2, etc.). This designator should be used consistently throughout the plan set (elevations, roof plans, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation.

B. AREA - Enter the actual area, in ft^2, of each assembly.

C. SOLAR FACTOR - Enter the solar factor for the applicable climate zone from Table 143-D of the Standards.

D. WEIGHTING FACTOR - Enter the appropriate weighting factor based on climate zone and Nonresidential or High-Rise Residential from Standards Table 143-E.

E. PROPOSED U-FACTOR - Enter the U-factor of the proposed assembly as designed. U-factors are taken from a table in Joint Appendix IV, Roofs and Ceiling.

F. PROPOSED ABSORPTANCE (α)- Enter the absorptance of the proposed roof assembly. Use an absorptance from item 8 above for roofs not certified under CRRC-1.

G. PROPOSED HEAT GAIN - The numbers from COLUMNS B, C, D, E, and F are multiplied and entered in this column.

H. AREA (ADJUSTED) - If no skylight area adjustments are required (as demonstrated on Part 1), then the STANDARD AREA is the same as the PROPOSED AREA for each roof assembly. If adjustments are required, then the adjusted areas of skylight and roof are taken from Part 6 of 7.

I. STANDARD U-FACTOR - Enter the standard U-factor for each roof assembly, taken from Standards Tables 143-A, 143-B, or 143-C.

J. STANDARD ABSORPTANCE (α) - Enter 0.45 as the absorptance of the standard roof assembly for nonresidential buildings with low-sloped roofs and 0.73 for nonresidential buildings with high-sloped roofs, for high-rise residential buildings, and guest rooms of hotel/motel buildings.

K. STANDARD HEAT GAIN - Multiply COLUMNS C, D, H, I and J and enter the result here.

Columns G and K are totaled. These subtotals are entered under 'Part 5 Subtotal' in COLUMNS I and M of ENV-3-C, Part 6 of 7.

ENV-3-C Part 6 of 7 Overall Heat Gain from Radiation

Overall Heat Gain from Fenestration

This form should be used to calculate the radiation heat gain through fenestration for the standard building and proposed building.

A. WINDOW/SKYLIGHT NAME - Provide a name or designator for each orientation of glazing under the appropriate heading (NORTH, SOUTH, SKYLIGHTS, etc.). This designator should be used consistently throughout the plan set (elevations, roof plans, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation.

B. WEIGHTING FACTOR - Enter the weighting factor for each orientation and skylight. The weighting factors are taken from Table 143-E for the appropriate climate zone

C. PROPOSED AREA - The total area of proposed windows and skylights shown on the plans is entered here.

D. SOLAR FACTOR - Enter the solar factor for the applicable climate zone from Standards Table 143-D.

E. PROPOSED SHGC - The proposed solar heat gain coefficient of the glazing.

F.-H. PROPOSED OVERHANG - Indicate the overhang horizontal length (H), the overhang vertical height (V), overhang ratio (H/V) and overhang factor (OHF). Column F includes both (H for horizontal) and (V for vertical). The overhang adjustment does not apply to skylights. Note: if there is no overhang for the window, values for H and V are not required and the OHF is set to 1.

I. PROPOSED TOTAL - Multiply COLUMNS B, C, D, E & H and enter the result here.

J. STANDARD AREA - If no window or skylight area adjustments are required (as demonstrated on Part 1), then the STANDARD AREA is the same as the PROPOSED AREA for each window and skylight. If adjustments are required, then the adjusted areas are taken from Part 6.

K. STANDARD RSHG - This is the maximum relative solar heat gain taken from Standards Tables 143-A, 143-B, and 143-C for the specified window orientation (north or non-north) and the actual fenestration area if actual is less than 40% WWR; otherwise it is set to the RSHG for 40% WWR. The maximum relative solar heat gain coefficient for skylights is taken from the same table, depending on whether the skylight glazing is made of glass or plastic.

L. SOLAR FACTOR - Enter the solar factor for the applicable climate zone from Standards Table 143-D.

M. STANDARD TOTAL - Multiply COLUMNS B, J, K, & L and enter the result here.

COLUMNS I and M are totaled. Totals from COLUMNS F and J from Part 4 of 7 and Part 5 of 7 are carried forward and added to Part 6 and the results compared. If the COLUMN I total is no greater than the COLUMN M total, then the overall heat gain requirement has been met.

ENV-3-C Part 7 of 7 Window Area Adjustment Calculations

If the WINDOW AREA TEST or the SKYLIGHT AREA TEST (Part 1 and 2 of this form) determines that area adjustments are not necessary, check the NOT APPLICABLE boxes. If the tests indicate that adjustments must be made, perform the calculations in the appropriate sections below.

A. WALL NAME - Provide a name or designator for each unique type and orientation of wall that contains windows (walls without windows will have no adjustment). If an orientation has two different wall types, list each separately. This designator should be used consistently throughout the plan set (elevations, finish schedules, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation.

B.-D. AREAS - List the areas (in ft^2). The GROSS AREA is the Gross Exterior Wall Area for the particular wall type and orientation under consideration. The DOOR AREA and WINDOW AREA are for doors and windows included in each wall.

E. WINDOW ADJUSTMENT FACTOR is calculated on the top half of Part 1. This is taken from Part 1 of the ENV-3-C form, and may vary by orientation.

F. ADJUSTED WINDOW AREA is calculated by multiplying the values in COLUMNS D and E.

G. ADJUSTED WALL AREA is calculated by subtracting B from the sum of C and F. If this produces a negative value enter zero.

Add COLUMNS B, C, D, F, and G. As a check, the total of COLUMN B should equal the sum of the totals of COLUMNS F & G.

The total in COLUMN F and G are used in COLUMN F of the Overall Heat Loss calculation (Part 3) and Column G of the Overall Heat Gain from Conduction calculation (Part 4) and the values in COLUMN G are used in COLUMNS H of the Overall Heat Gain from Radiation, Opaque Surfaces calculation (Part 5), and values in COLUMN F are used in COLUMN J of the Overall Heat Gain from Radiation, Fenestration Surfaces calculation (Part 6).

Skylight Area Adjustment Calculations

A. ROOF NAME - Provide a name or designator for each unique type of roof that contains skylights (roofs without skylights will have no adjustment). If an orientation has two different roof types, list each separately. This designator should be used consistently throughout the plan set (roof plans, skylight schedules, etc.) to identify each surface. It should also be consistently used on the other forms in the compliance documentation.

B.-C. AREAS - List the areas (in ft^2). The GROSS AREA is the gross exterior roof area for the particular roof type and orientation under consideration; note that it does not include doors, such as roof hatches. The SKYLIGHT AREA is for skylights included in each roof.

D. SKYLIGHT ADJUSTMENT FACTOR is the skylight adjustment factor calculated on Part 2. It is the same for all skylights in the building.

E. ADJUSTED SKYLIGHT AREA is calculated by multiplying the values in COLUMNS C and D.

F. ADJUSTED ROOF AREA is calculated by subtracting E from B. If this results in a negative value enter zero.

COLUMNS B, C, E and F are added. As a check, the total of COLUMN B should equal the sum of the totals of COLUMNS E and F.

The totals in COLUMNS E and F are used in COLUMN F of the Overall Heat Loss calculation (Part 3) and in COLUMN G of the Overall Heat Gain from Conduction calculation (Part 4), and values in COLUMN F are used in COLUMN H of the Overall Heat Gain from Radiation, Opaque Surfaces calculation (Part 5), and values in COLUMN E are used in COLUMN J of the Overall Heat Gain from Radiation, Fenestration Surfaces calculation (Part 6).

3.10.4 ENV-4-C Minimum Skylight Area for Large Enclosed Spaces

This form must be filled out if the building contains an enclosed space with a floor area greater than 25,000 ft^2, a ceiling height of greater than 15 feet and an LPD of equal or greater to 0.5 W/ft^2.

If this section applies, the minimum skylight area is determined either as a fraction of the daylit area or from the minimum effective aperture area. To determine the minimum area as a fraction of daylit area, fill in steps A-E of this worksheet. To determine the minimum area based on minimum effective aperture area, fill in steps F-N of this worksheet.

This is the prescriptive minimum skylight area. If skylights are not desired, an alternative building can be built as long as the proposed building is shown to consume less energy than a building with the prescriptive number of skylights.

ENV-4-C Part 1 of 2

Minimum Fraction of Daylit Area Method

A. PROPOSED DAYLIT AREA - Enter the proposed daylit area as indicated on the plans schedule and enter the relevant page number of the plans.

B. MINIMUM DAYLIT AREA - Enter the result of the enclosed floor area and multiply by 0.50..

Checks the box if Criteria 1, “Proposed Daylit Area is equal to or greater than Minimum Daylit Area,” is met; otherwise, go to the next criteria section.

C. SKYLIGHT-DAYLIT FRACTION – Select one of the boxes corresponding to the proposed installed LPD of the enclosed space and enter the resulting percentage in the box on the right.

D. MINIMUM SKYLIGHT AREA – The product of B and C is the minimum skylight area to daylit area.

E. PROPOSED SKYLIGHT AREA – Enter the proposed total skylight area in the large enclosed space that matches the plans and include the page from the plans.

Check the box if Criteria 2, ”Proposed skylight area is equal to or greater than minimum skylight area,” is met; otherwise go to next criteria section.

Check the box if Criteria 3, ” Haze rating of skylight glazing or skylight diffuser is greater than 90%,” is met and enter the document and page number with “haze” specification of skylights. Otherwise go to the next criteria section.

Check the box if the large enclosed space complies with Criteria 1, 2, and 3 above.

ENV-4-C Part 2 of 2

Minimum Effective Aperture Ratio

F. PROPOSED DAYLIT AREA - Enter the proposed daylit area as indicated on the plans schedule and enter the relevant page number of the plans.

G. MINIMUM DAYLIT AREA - Enter the large enclosed floor area and multiply by 0.50.

Checks the box if Criteria 1, “Proposed Daylit Area is equal to or greater than Minimum Daylit Area,” is met; otherwise go to next criteria section.

H. MINIMUM EFFECTIVE APERTURE – Select one of the boxes corresponding to the proposed installed LPD of the enclosed space and enter the resulting percentage in the box on the right.

I. SKYLIGHT VISIBLE TRANSMITTANCE (VLT) – Enter the VLT value in this box from manufacturer’s literature.

J. CALCULATE THE WELL CAVITY RATIO – Determine if the well is rectangular or non-rectangular, select one of the well types, fill in columns A, B,

C and calculate the WCR with the appropriate equation. See §146 for additional details.

K. AVERAGE WELL WALL REFLECTANCE – This is used with the WCR to determine the well efficiency. This reflectance is determined as shown in the Illumination Engineering Society of North America, IESNA Lighting Handbook, Ninth Edition (2000).

L. WELL EFFICIENCY – This is determined from the nomograph in Figure 146-A in the Standards. See Chapter 5, Section 5.6 of this manual. Average skylight well wall reflectance and WCR are required.

M. MINIMUM SKYLIGHT AREA – Follow the equation listed on the form to calculate the minimum skylight area by minimum effective aperture.

N. PROPOSED SKYLIGHT AREA – Enter the proposed skylight area in this box. The proposed area must exceed the minimum requirement specified in field D or field E of Part 1 of 2 of this form.

Check the box if Criteria 2, “Proposed skylight area is equal to or greater than minimum skylight area,” is met; otherwise go to the next criteria section.

Check the box if Criteria 3, “Haze rating of skylight glazing or skylight diffuser is greater than 90%.” Enter the document and page number with haze specification of skylights. Otherwise go to the next criteria section.

Check the box if the large enclosed space complies with Criteria 1, 2, and 3 above (Section 143(c), items 1-3).

criteria previously described it must meet or exceed the leakage rate of ≤ 6% of fan flow.

If the new ducts are an extension of an existing duct system the combined system (new and existing ducts) must meet:

- A leakage rate of < 15% of fan flow, or
- A reduction in leakage rate of ≥ 60% (as compared to the existing ductwork) with all "accessible" leaks demonstrated through visual inspection to have been sealed, or
- All accessible leaks shall be sealed and verified through a visual inspection by a certified HERS rater.

There is an exception for ducts that are connected to existing ducts with asbestos insulation or sealant.

These requirements also apply to cases where existing HVAC equipment is either repaired or replaced. With exceptions for ducts that are insulated or sealed with asbestos and an existing duct system that has previously been leakage tested by a certified California HERS rater (see http://www.energy.ca.gov/HERS/).

One can avoid sealing the ducts by insulating the roof and sealing the attic vents as part of a larger remodel, thereby creating a conditioned space within which the ducts are located, and no longer meets the criteria of §144 k.

Another alternative to duct sealing is to install a high efficiency air conditioner that will save as much energy as the duct system is losing though leaks. This trade-off can be calculated using the performance software or by using pre-calculated equipment efficiencies deemed comparable to duct sealing. In climate zones 1-15, systems with air conditioner efficiencies at least as high as those in Table 4-5 are deemed equivalent to duct sealing.

Section 4.4.3 describes mandated acceptance test requirements for ductwork.

Table 4-5 – Single Zone Air-Conditioner Efficiency Deemed Comparable to Duct Sealing

	Air conditioner		Heat Pump	
CTZ	< 65,000 Btu/h SEER/EER	≥ 65,000 Btu/h EER	< 65,000 Btu/h R/EER	≥ 65,000 Btu/h EER
1	13.5/11.2	11.3	13.0/10.6	11.0
2	13.8/11.4	11.5	13.3/11.0	11.5
3	13.2/11.0	11.1	13.0/10.7	11.0
4	13.4/11.1	11.3	13.1/10.9	11.2
5	13.2/11.0	11.0	13.0/10.8	11.0
6	13.1/10.9	11.0	13.1/10.9	11.0
7	13.3/11.0	11.1	13.3/11.0	11.1
8	13.5/11.2	11.3	13.4/11.1	11.3
9	13.7/11.4	11.4	13.6/11.3	11.4
10	13.9/11.5	11.7	13.9/11.5	11.7
11	14.2/11.8	11.9	13.3/11.0	11.7
12	14.0/11.6	11.9	13.3/11.0	11.9
13	14.3/11.9	12.0	13.7/11.4	11.9
14	14.2/11.8	12.0	13.6/11.3	11.9
15	14.5/12.0	12.1	14.5/12.0	12.1
16	14.0/11.6[1]	12.1[1]	13.0/10.8	11.7

1. In climate zone 16, the equivalent efficiency system must have high efficiency heating system in addition to the minimum air conditioner efficiency In Table 4-5. A high heating efficiency system has a minimum thermal efficiency of 96% or an AFUE of 94% for furnaces and a minimum HSPF of 8.4 or a COP of 3.8 for heat pumps.

Example 4-19

Question

A new 20 ton single zone system with new ductwork serving an auditorium is being installed. Approximately ½ of its ductwork on the roof. Does it need to be leak tested?

Answer

Probably not. Although this system meets the criteria of being single zone and having more than ¼ of the duct surface area on the roof, the unit probably serves more than 5,000 ft^2 of space. Most 15 and 20 ton units will serve spaces that are significantly larger than 5,000 ft^2. If the space is 5,000 ft^2 or less the ducts do need to be leak tested per §144(k).

Example 4-20

Question

A new 5 ton single zone system with new ductwork serving a 2,000 ft^2 office is being installed. The unit is a down discharge configuration and the roof has insulation over the deck. Does the ductwork need to be leak tested?

Answer

Probably not. Although this system meets the criteria of being single zone and serving less than 5,000 ft^2 of space, it does not have ¼ of its duct area in one of the spaces listed in §144(k). With the insulation on the roof and not on the ceiling, the plenum area likely meets the criteria of indirectly conditioned so no leakage testing is required.

A. The total fan power index at design conditions of each fan system with total horsepower over 25 horsepower shall not exceed 1.25 watts per cfm of supply air; and

B. Individual VAV fans with motors 10 horsepower or larger shall meet one of the following:

i. The fan motor shall be driven by a mechanical or electrical variable speed drive.

ii. The fan shall be a vane-axial fan with variable pitch blades.

iii. For prescriptive compliance, the fan motor shall include controls that limit the fan motor demand to no more than 30% of the total design wattage at 50% of design air volume when static pressure set point equals 1/3 of the total design static pressure, based on certified manufacturer's test data.

C. Static Pressure Sensor Location. Static pressure sensors used to control variable air volume fans shall be placed in a position such that the controller set point is no greater than one-third the total design fan static pressure, except for systems with zone reset control complying with 144 (c) 2 D. If this results in the sensor being located downstream of major duct splits, multiple sensors shall be installed in each major branch with fan capacity controlled to satisfy the sensor furthest below its setpoint.

D. Set Point Reset. For systems with direct digital control of individual zone boxes reporting to the central control panel, static pressure set point shall be reset based on the zone requiring the most pressure; i.e., the set point is reset lower until one zone damper is nearly wide open.

3. Air-treatment or filtering systems. For systems with air-treatment or filtering systems, calculate the adjusted fan power index using equation 144-A:

EQUATION 144-A ADJUSTED FAN POWER INDEX

Adjusted fan power index = Fan power index x Fan Adjustment

Fan Adjustment = ·□1-(SPa - 1)/ SPf.

WHERE:

SPa = Air pressure drop across the air-treatment or filtering system.

SPf= Total pressure drop across the fan.

4. Fan motors of series fan-powered terminal units. Fan motors of series fan-powered terminal units 1 horsepower or less in shall

comply, total space-conditioning system power demands must not exceed 0.8 W/cfm for constant volume systems, or 1.25 W/cfm for VAV systems. See §144(c).

If filter pressure drop is greater than 1 inch W. C. Enter filter air pressure drop. SP_a on line 4 and total pressure drop across the fan SP_f on Line 5, otherwise leave blank and go to Line 7. See §144(c)3.

- SP_a is the air pressure drop across the air treatment or filtering system.
- SP_f is the total pressure drop across the fan.
- FAN ADJUSTMENT is the adjusted fan power index = 1-(SPa – 1)/ SPf.
- ADJUSTED FAN POWER INDEX is the total fan systems power index multiplied with the fan adjustment (Line 3 x Line 6). Note: TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 W/cfm, for Constant Volume systems or 1.25 W/cfm for VAV systems).

This bottom portion of the form is used to document the Electric Resistance Heating, Heat Rejection System and Air Cooled Chiller Limitations.

Electric Resistance Heat Limitation

In the capacity column, enter the total installed capacity of all electric heat exclusive of electric heat for heat pumps. If electric heat is used, identify in the exception column, which exceptions to §144(g) apply.

Enter notes to building department in the Notes column.

Centrifugal Fan Cooling Tower Limitation

In the capacity column, enter the total installed capacity of the centrifugal cooling towers. If centrifugal fan cooling towers are used, identify in the exception column which exceptions to §144(h) apply.

Enter notes to building department in the Notes column.

Air-cooled Chiller Limitation

In the capacity column, enter the total installed capacity of air-cooled chillers. In the second box, If the total installed capacity of the chiller plant is greater than 300 tons and the total installed capacity of air-cooled chillers is greater than 100 tons, identify in the exception column which exceptions to §144(i) apply.

Enter notes to building department in the Notes column.

4.11.8 Mechanical Inspection

The mechanical building inspection process for energy compliance is carried out along with the other building inspections performed by the building department. The inspector relies upon the plans and upon the MECH-1-C Certificate of Compliance form printed on the plans (See Section 4.11.1).

- *Lighting in Bathrooms, Laundry Rooms and Utility Rooms.* All luminaires shall either be high efficacy or shall be controlled by a manual-on occupant sensor.
- *Other Rooms (other than Kitchens, Bathrooms, Laundry Rooms and Utility Rooms).* All luminaires shall either be high efficacy or shall be controlled by a manual-on occupant sensor or dimmer.
- *Outdoor Lighting.* All luminaires mounted to the outside of the nonresidential buildings must meet the requirements of §147 of the Standards. See Chapter 6, Outdoor Lighting and Signs, of this Manual for more details.
- *Common Areas of Low-Ride Multifamily Buildings*. All luminaires in the common areas of low-rise multifamily buildings shall either be high efficacy or shall be controlled by an occupant sensor. All high efficacy luminaires must meet the requirements of §150(k). See Section 5.13 of this chapter for more details.
- All High Rise Residential Living Quarters lighting need to comply with §150(k)
- Hotel/Motel garages must meet the requirements of the Area Category Method of §146, Table 146-C.

5.2.1.4 Daylighting Controls

§131(c)

A substantial fraction of electric lighting energy can be saved if lights are turned off whenever there is sufficient daylight. §131(c) has a series of mandatory requirements for the control of electric lighting in daylit areas. These control requirements range from separate manual switching of lights near windows to skylights when the daylit area is greater than 250 ft^2.

There are mandatory control requirements for prescriptive measures such as the requirement for automatic controls when the daylit area under skylights is greater than 2,500 ft^2.

Although prescriptive compliance requires skylights in large spaces, this requirement can be traded-off against other building features using the performance method.

If skylights are installed to meet prescriptively requirements or where skylights with automatic daylighting controls are modeled for compliance under the performance method, there are mandatory automatic daylighting control requirements that must be met to assure energy savings are realized. In those spaces where skylights are not required but are installed for other reasons and the daylit areas are less than 2,500 square feet, there are no mandatory control requirements for automatic daylighting controls; however, if automatic daylighting controls are installed in the space, those controls must meet the mandatory requirements of §119, §130, and §132. If the daylit area is greater than 2,500 square feet, the automatic daylighting controls must be installed

Automatic daylight control devices include stepped dimming, continuous dimming, and stepped switching devices. For definitions of these terms see §101 of the standards or the definitions in the Joint Appendix I.

- Wattage (or VA) rating of an integral current limiter controlling the track system, or
- 15 watts per linear foot of the track

For branch circuits with multiple tracks, with every track equipped with an integral current limiter, the rating shall be the higher of 15 watts per linear foot or the sum of the wattage (or VA) rating of all current limiters controlling the tracks. For branch circuits that have a mix of tracks with and without current limiters, the wattage of the tracks without integral current limiters shall be determined by method 2 below.

2. The higher of 45 W per linear foot of the track or total wattage of all of the luminaires included in the system. Determine the wattage of each luminaire (track head) according to § 130 (c) of the Standards. Luminaire wattage for incandescent track heads shall meet the requirements of S § 130 (c) 1, based on the maximum relamping rated wattage as listed on a permanent factory-installed label. Luminaire wattage for fluorescent and high intensity discharge (HID) track heads shall meet the requirements of § 130 (c) 2, based on the operating input wattage of the rated lamp/ballast combination. Luminaire wattage for low-voltage track heads (when mounted on line-voltage track) shall meet the requirements of § 130 (c) 5, based on the maximum rated wattage of the transformer on each track head. This method applies to single and multi circuit track.

When using an integral current limiter, such device shall be permanently attached to or an integral part of the track. The VA rating of the current limiter shall be clearly marked on the device and readily available for the building officials' field inspection without opening coverplates, fixtures or panels. Access to wiring connections shall employ tamper resistant hardware and a conspicuous label shall be permanently affixed to the wiring compartment warning against removing, tampering with, rewiring, or bypassing the device.

If a current limiter is used to achieve compliance for tracks, the manufacturer of the current limiting device must certify to the commission that the device complies with all of the applicable requirements of Standards §130 (c) 3 and Section 5.4.3 of this manual, Determining Luminaire Wattage.

Low-Voltage Tracks

Low-voltage tracks, cable conductors, rail conductors, and other low voltage flexible lighting systems which are serviced through permanently installed transformers must use the specified rated wattage of the transformer feeding the system, as shown on a permanent factory-installed label per UL-1574 or UL-1598, as the actual lighting power of the track.

In some situations, extra length of track is desired to provide greater flexibility in locating lighting fixtures. In these cases, the designer can limit the actual lighting power by providing interlock switching that limits the circuits (and therefore the electric capacity) of track lighting that can be operated simultaneously.

LTG-1-C Part 1 of 4

Project Description

1. PROJECT NAME is the title of the project, as shown on the plans and known to the building department.
2. DATE is the date of preparation of the compliance submittal package. It should be on or after the date of the plans, and on or before the date of the building permit application.
3. PROJECT ADDRESS is the address of the project as shown on the plans and as known to the building department.
4. PRINCIPAL DESIGNER - LIGHTING is the person responsible for the preparation of the lighting plans, one of two people who sign the STATEMENT OF COMPLIANCE (see below). The person's telephone number is given to facilitate response to any questions that arise.
5. DOCUMENTATION AUTHOR is the person who prepared the energy compliance documentation. This may or may not be the principal designer (it may be a person specializing in energy standards compliance work). This person is not subject to the Business and Profession's Code. The person's telephone number is given to facilitate response to any questions that arise.
6. ENFORCEMENT AGENCY USE is reserved for building department record keeping purposes.

General Information

1. DATE OF PLANS is the last revision date of the plans. If the plans are revised after this date, it may be necessary to resubmit the compliance documentation to reflect the altered design. The building department will determine whether or not the revisions require this.
2. BUILDING CONDITIONED FLOOR AREA has specific meaning under the Standards. Refer to Joint Appendix I for a discussion of this definition.
3. The number entered here should match the floor area entered on form ENV-1-C.
4. CLIMATE ZONE of the building. Refer to Joint Appendix I.
5. BUILDING TYPE is specified because there are special requirements for high-rise residential and hotel/motel guest room occupancies. All other occupancies that fall under the Nonresidential Standards are designated "Nonresidential" here. It is possible for a building to include more than one building type. See §149 in the Standards for the formal definitions of these occupancies.
6. CONDITIONED SPACE is a space that is directly or indirectly air-conditioned. Check this box if the building includes conditioned spaces where lighting systems are being installed. Tradeoffs are not allowed between conditioned and unconditioned spaces.
7. UNCONDITIONED SPACE is a space that is not directly or indirectly air-conditioned. Check this box if the building includes unconditioned spaces where lighting systems are being installed. Tradeoffs are not allowed between conditioned and unconditioned spaces.

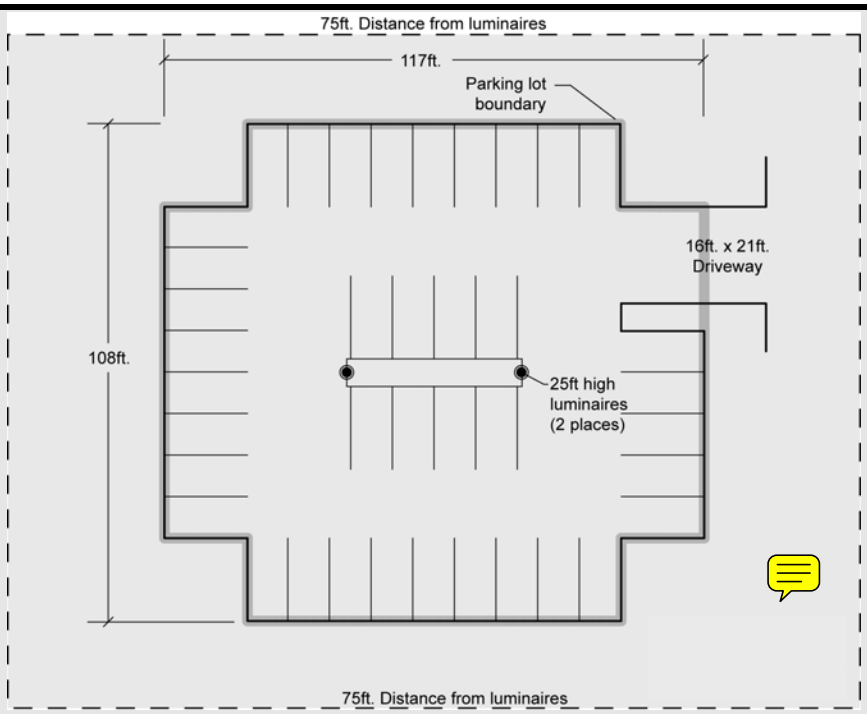
8. INDOOR AND OUTDOOR SIGNS are internally illuminated signs that are located either indoor or outdoor. If these signs are present, the Form OLTG-4-C must be filled out along with either LTG-1-C or OLTG-1-C.
9. PHASE OF CONSTRUCTION indicates the status of the building project described in the documents. Refer to Joint Appendix I for detailed definitions.

    - NEW CONSTRUCTION should be checked for all new buildings, newly conditioned space (see §149 in the Standards) or for new construction in existing buildings (tenant improvements, see Section **1.7.10**) that are submitted for envelope compliance.
    - ADDITION should be checked for an addition which is not treated as a stand-alone building, but which uses Option 2 described in §149 in the Standards.
    - ALTERATION should be checked for alterations to existing building lighting systems. See Section 5.13.
    - METHOD OF COMPLIANCE indicates which method is being used and documented with this submittal:
    - PERFORMANCE should be checked when the performance method is used to show compliance. All required performance documentation must be included in the plan check submittal when this method is used.
    - COMPLETE BUILDING should be checked if the lighting system complies using the complete building method, as documented on the LTG-2-C Form
    - AREA CATEGORY should be checked if the lighting system complies using the area category method, as documented on the LTG-2-C form
    - TAILORED should be checked if the tailored method of lighting compliance, with supporting documentation (LTG-6-CC-05 and LTG-7-C) is submitted.
    - COMMON LIGHTING should be checked if the common lighting method of lighting compliance, with supporting documentation (LTG-8-C) is submitted.

Lighting Mandatory Measures

This portion requests the location of notes clarifying the inclusion of the mandatory requirements. Notes should be included on the plans to demonstrate compliance with mandatory requirements of the Standards.

Following are prototype examples of the notes that should be rewritten to actual conditions. A note for each of the items listed should be included, even if the note states “not applicable”.



Answer

The two luminaires create a maximum illuminated area that extends 75 ft (3 x 25 ft) in all four directions. The boundary of the maximum illuminated area extends beyond the edges of the parking lot as well as the entrance drive so the entire paved area is considered illuminated. The landscaped island near the entrance is less than 10 ft wide, so it too is included as part of the illuminated area. The landscaped cutouts (15 x15 ft) in the corners of the parking lot are bound by pavement on only two sides so they are not included. The illuminated area of the parking lot is 13,986 ft² [12,636 ft² - 900 ft² (cutouts) + 2,250 ft² (5ft band). The illuminated area of the driveway is 16 ft x 21 ft or 336 ft². The total area is 14,332 ft² and the allowance for Lighting Zone 3 is 0.15 W/ft². The maximum power is therefore 2,148 watts.

Example 6-17

Question

In the parking lot layout shown above, what would the illuminated area be and what would the maximum allowed lighting power be if the two luminaires were mounted at a height of 15 feet and the two poles were placed 30 feet apart?

Answer

If the mounting height is reduced to 15 ft, then the illuminated area is 120 ft by 90 ft. The top 9 feet and bottom 9 feet of the parking lot must be excluded from the illuminated area of the parking lot.

Question

If the parking lot shown in the previous examples (with 25 ft mounting height) were in a jurisdiction that required a minimum of 2 footcandles of parking lot illumination, what would be the allowed lighting power?

Answer

Referring to Standards Table 147-C, the allowed lighting power density for 2 footcandles is 0.12 W/ft², which is lower than the 0.15 allowed for Lighting Zone 3, so no additional power would be permitted. However, if the local ordinance required an average 3 footcandles, then the maximum lighting power density would be 0.19 W/ft² and lighting power could be increased to 0.19 W/ft² x 17,400 ft² or 3,306 watts.

Adjustments For Security

Exception 2 to 147(c)1.B.
Table 147-D

In some situations higher lighting levels may be required because of special security requirements. Lighting power may be increased by values in Standards Table 147-D for security reasons in three cases:

- For retail parking lots in Lighting Zones 1, 2, and 3, the lighting power allowance from Standards Table 147-A may be increased by 25% (multiply the value by 1.25).
- For hardscape areas (plazas, pedestrian ways, parking, or roadways) within 100 ft of the entrance of senior housing facilities, the lighting power allowance from Standards Table 147-A may be increased by 25% (multiply the value by 1.25).
- For parking lots and walkways within 60 ft of building entrances for law enforcement, fire, ambulance and emergency vehicle facilities, the lighting power allowance from Standards Table 147-A may be doubled (multiply the value by 2.0).

When the security adjustment is used, the areas affected shall be considered special applications and no tradeoffs are permitted. The area of security lighting is dropped from the area of general site illumination and it is treated as a special use-it-or-lose-it allowance. Luminaires that are used for this special security lighting shall not create illuminated area for the purpose of determining general site illumination.

Table 6-5 – Standards Table 147-D Adjustments for Security

Function Area	Multiplier
Retail parking lots in Lighting Zones 1, 2 and 3	1.25
Hardscape areas within 100 feet of the entrance of senior housing facilities in Lighting Zones 1, 2, and 3	1.25
Parking lots and walkways within 60 feet of entrances to the building for law enforcement, fire, ambulance and emergency vehicle facilities	2.0

Example 6-19

- TELEPHONE is the phone number where the testing authority can be reached during regular business hours.

General Information

This section consists of a combination of data entry requirements and check boxes, all of which are self-explanatory. Complete check boxes and enter data as instructed.

Statement of Acceptance

This section consists of a combination of check boxes and data entry requirements, including signature; date; and license number. Complete check boxes and enter data as instructed.

MECH-1-A - Certificate of Acceptance Part 2 of 2

The form is used to document the overall final results of all acceptance test.

Summary of Acceptance Tests

- SYSTEM ACCEPTANCE DOCUMENT refers to the name of the test Form that has been completed. For example: "Ventilation System Acceptance document (AHU-1). This designates the acceptance test of outside air ventilation for air handling unit #1. Typically an individual form is completed for each piece of equipment tested.
- TESTING AUTHORITY is the person's name responsible for verifying all acceptance tests were performed and each system passed.
- DATE OF TEST is the date each test was actually performed.
- PASS/FAIL is the final outcome of the acceptance test.

MECH-2-A - Ventilation System Acceptance Document

This form is used to document results of the minimum outside air ventilation tests for both constant and variable air volume fan systems. A separate form should be completed for each system tested. The form is separated into six basic sections: project information; pre-test inspection; equipment testing; testing calculations and results; pass/fail evaluation; and certification statement. Each section consists of a combination of data entry requirements and check boxes.

- Certificate of Acceptance (3 pages)
- Lighting Control Acceptance Document
- Automatic Daylighting Controls Acceptance Document

LTG-1-A - Certificate of Acceptance Part 1 of 2

The form is separated into three basic sections: project information; general information; and statement of acceptance. Each section consists of a combination of data entry requirements and check boxes.

Project Information

- PROJECT NAME is the title of the project, as shown on the Code Compliance forms.
- DATE is the date of preparation of the compliance submittal package.
- PROJECT ADDRESS is the address of the project as shown on the Code Compliance forms.
- TESTING AUTHORITY is the person responsible for verifying all acceptance tests were performed and each system passed.
- TELEPHONE is the phone number where the testing authority can be reached during regular business hours.

General Information

This section consists of a combination of data entry requirements and check boxes, all of which are self explanatory. Complete check boxes and enter data as instructed.

Statement of Acceptance

- This section consists of a combination of check boxes and data entry requirements, including signature; date; and license number. Complete check boxes and enter data as instructed.

LTG-1-A - Certificate of Acceptance Part 2 of 2

The form is used to document the overall final results of all acceptance test.

Summary of Acceptance Tests

- SYSTEM ACCEPTANCE DOCUMENT refers to the name of the test form that has been completed. For example: “Lighting Control Acceptance document, LTG-2-A. This designates the acceptance test of outside air ventilation for air handling unit #1. Typically an individual form is completed for each piece of equipment tested.
- TESTING AUTHORITY is the person responsible for verifying all acceptance tests were performed and each system passed.

- DATE OF TEST is the date each test was actually performed.
- PASS/FAIL is the final outcome of the acceptance test.

LTG-2-A - Lighting Control Acceptance Document

This form is used to document the results for various lighting control tests. The form was designed so that data for three lighting control strategies (occupancy sensors, manual daylight control, and automatic time switch) could be recorded on one form. The form is separated into six basic sections: project information; pre-test inspection; select acceptance tests; equipment testing requirements; pass/fail evaluation; and certification statement. Each section consists of a combination of data entry requirements and check boxes.

Project Information

- PROJECT NAME is the title of the project, as shown on the Code Compliance forms.
- DATE is the date of preparation of the compliance submittal package.
- PROJECT ADDRESS is the address of the project as shown on the Code Compliance forms.
- TESTING AUTHORITY is the person responsible for verifying all acceptance tests were performed and each system passed.
- TELEPHONE is the phone number where the testing authority can be reached during regular business hours.
- LIGHTING CONTROL SYSTEM NAME/DESIGNATION is the name or unique identifier for the system(s) being tested. For example: “occupancy sensors and lighting sweep”

Pre-test Inspection

- This section consists of check boxes. Complete check boxes as instructed.

Select Acceptance Test

- This section documents which of the acceptance tests were performed. Check the appropriate box for each applicable test.

Appendix A
Compliance & Acceptance Forms

	Certificate of Compliance Forms and Worksheets		
Envelope	**Mechanical**	**Lighting**	**Outdoor Lighting**
ENV-1-C Certificate of Compliance **ENV-2-C** Envelope Component Method **ENV-3-C** Overall Envelope **Method** **ENV-4-C** Skylight Area Support Worksheet	**MECH-1-C** Certificate of Compliance **MECH-2-C** Air System, Water Side System, Service Hot Water & Pool Requirements **MECH-3-C** Mechanical Ventilation **MECH-4-C** HVAC Misc. Prescriptive Requirements	**LTG-1-C** Certificate of Compliance **LTG-2-C** Indoor Lighting Schedule LTG-3-C Portable Lighting Worksheet **LTG-4-C** Lighting Controls Credit Worksheet **LTG-5-C** Indoor Lighting Power Allowance **LTG-6-C** Tailored Method Worksheet **LTG-7-C** Room Cavity Ratio Worksheet **LTG-8-C** Common Lighting Systems Method **LTG-9-C** Line Voltage Track Lighting Worksheet	**OLTG-1-C** Certificate of Compliance **OLTG-2-C** Lighting Compliance Summary **OLTG-3-C** Illuminated Area Calculation Worksheet **OLTG-4-C** Sign Lighting Compliance
	Certificate of Acceptance Forms and Worksheets		
	Mechanical		**Outdoor Lighting**
	MECH-1-A Certificate of Acceptance **MECH-2-A** Ventilation Systems – Variable and Constant Volume **MECH-3-**A Packaged HVAC Systems **MECH-4-A** Economizer **MECH-5-A** Air Distribution **MECH-6-A** Demand Control Ventilation **MECH-7-A** Supply Fan VFD **MECH-8-A** Hydronic Systems Control		**LTG-1-A** Certificate of Acceptance **LTG-2-A** Lighting Controls **LTG-3-A** Automatic Daylighting

ENVELOPE COMPONENT METHOD (Part 1 of 2) ENV-2-C

PROJECT NAME	DATE

WINDOW AREA CALCULATION

A. DISPLAY PERIMETER		FT × 6 FT =	SF	DISPLAY AREA
B. GROSS EXTERIOR WALL AREA		SF × 0.40 =	SF	40% of GROSS EXTERIOR WALL AREA
C. ENTER LARGER OF A OR B			SF	MAXIMUM STANDARD AREA
D. ENTER PROPOSED WINDOW AREA			SF	PROPOSED WINDOW AREA

If the PROPOSED WINDOW AREA is greater than the MAXIMUM STANDARD AREA then the envelope component method may not be used.

E. WINDOW WALL RATIO = Proposed Window Area Divided by Gross Exterior Wall Area =

F. WEST DISPLAY PERIMETER		FT × 6 FT =	SF	WEST DISPLAY AREA
G. WEST EXTERIOR WALL AREA		SF × 0.40 =	SF	40% of WEST EXTERIOR WALL AREA
H. ENTER THE LARGER OF F AND G			SF	MAXIMUM STANDARD WEST AREA
I. ENTER PROPOSED WEST WINDOW AREA			SF	PROPOSED WEST WINDOW AREA

If the PROPOSED WEST WINDOW AREA is greater than the MAXIMUM STANDARD WEST AREA then the envelope component method may not

J. WEST WINDOW WALL RATIO = Proposed West Window Area Divided by West Exterior Wall Area =

SKYLIGHT AREA CALCULATION

A. ATRIUM or SKYLIGHT HEIGHT	FT		
	GROSS ROOF AREA		STANDARD ALLOWED SKYLIGHT AREA
B. IF Atrium/Skylight Height in A ≤ 55 FT		SF × 0.05 =	SF
C. IF Height in A > 55 FT		SF × 0.10 =	SF
D. PROPOSED SKYLIGHT AREA			SF

If the PROPOSD SKYLIGHT AREA is greater than the STANDARD ALLOWED SKYLIGHT AREA then the envelope component method may not be used.

SKYLIGHTS

SKYLIGHT NAME	SKYLIGHT GLAZING			# OF PANES	U-FACTOR		SOLAR HEAT GAIN COEFFICIENT	
(e.g., Sky-1, Sky-2)	✓ With Curb	✓ With No Curb	✓ Plastic		PROPOSED	ALLOWED	PROPOSED	ALLOWED
	☐	☐	☐					
	☐	☐	☐					
	☐	☐	☐					
	☐	☐	☐					
	☐	☐	☐					
	☐	☐	☐					
	☐	☐	☐					

RELOCATABLE PUBLIC SCHOOL BUILDINGS - See §143(a)8 in the Energy Standards

☐ For Specific Climate Zone, use Table 143-A - Prescriptive Envelope Criteria.	☐ Specific Climate Zone Metal Identification Label – Place two labels on each relocatable building and indicate on the building plans.
☐ For Any (All) Climate Zone, use Table 143-C - Prescriptive Envelope Criteria.	☐ Any (All) Climate Zone Metal Identification Label - Place two labels on each relocatable building and indicate on the building plans.

new text

ENVELOPE COMPONENT METHOD (Part 2 of 2) ENV-2-C

PROJECT NAME	DATE

COOL ROOFS - LOW-SLOPED - See Section 3.4 in the NRM and §118(i)3 and §143(a)1 in the Energy Standards for further description about exterior roofs and mandatory requirements for Cool Roofs.

✓ **CHECK APPLICABLE BOXES**

☐ **Option 1- Tested - Initial Thermal Emittance ≥ 0.75 and Intial Solar Reflectance ≥ 0.70**

Proposed emittance and reflectance must be ≥ the standard when tested with CRRC-1.	**Proposed**	**Standard**	
1. Enter proposed initial thermal emittance, $\varepsilon_{initial}$		≥ 0.75	If proposed ≥ to the Standard then it complies.
2. Enter the proposed initial solar reflectance, $\rho_{initial}$		≥ 0.70	If proposed ≥ to the Standard then it complies.

3. When applying **Liquid Field Applied Coatings,** the coating must be applied with a minimum dry mil thickness of 20 mils across the entire roof surface and meet minimum performance requirements listed in §118(i)3 and Table 118-C. Select the applicable coating:

☐ Aluminum-Pigmented Asphalt Roof Coating ☐ Cement-Based Roof Coating ☐ Other _____

☐ **Option 2 - CRRC-1 Tested - Initial Thermal Emittance < 0.75**

Proposed initial thermal emittance < 0.75 when tested with CRRC-1.	**Proposed**	**Standard**	
1. Enter proposed initial thermal emittance, $\varepsilon_{initial}$		< 0.75	Go to line 2. Insert $\varepsilon_{initial}$ value in calculation.
2. Enter the initial solar reflectance, $\rho_{initial}$		0.70 + [0.34 X (0.75 - $\varepsilon_{initial}$)]	**Standard** $\rho_{initial}$ =

3. To apply **Liquid Field Applied Coatings,** the coating must be applied with a minimum dry mil thickness of 20 mils across the entire roof surface and meet minimum performance requirements listed in §118(i)3 and Table 118-C. Select the applicable coating:

☐ Aluminum-Pigmented Asphalt Roof Coating ☐ Cement-Based Roof Coating ☐ Other _____

✓ ☐ **CRRC-1 Label Attached to Submittal**
(Note if no CRRC-1 label is available, this compliance method can not be used).

New Text

OPAQUE SURFACES

ASSEMBLY NAME (e.g. Roof-1, Wall-1, Floor-, Soffits, etc…)	**TYPE** (e.g. Roof, Wall, Floor, demising, etc…)	HEAT CAPACITY	**INSULATION R-VALUE*** PROPOSED	MINIMUM ALLOWED	**ASSEMBLY U-FACTOR*** PROPOSED	Joint Appendix IV REF	MAXIMUM ALLOWED

* For each assembly type, meet the minimum insulation R-value or the maximum assembly U-factor.

WINDOWS

WINDOW NAME (e.g., Window-1, Window-2)	**ORIENTATION** ✓ N	✓ E	✓ S	✓ W	**Fenestration** U-FACTOR PROP.	ALLOW.	# OF PANES	Fen. SHGC*	**PROPOSED RSHG** H	V	H/V	OHF	PROP. RSHG	ALLOWED RSHG
	☐	☐	☐	☐										
	☐	☐	☐	☐										
	☐	☐	☐	☐										
	☐	☐	☐	☐										
	☐	☐	☐	☐										

* From Fenestration Surfaces ENV-1-C, Part 2, Column G, or when Column H has a "C" identifier, calculate using the center of glass value SHGCc in $SHGC_{FEN}$ = .08 + (.86 x SHGCc) and enter value.

CERTIFICATE OF COMPLIANCE (Part 1 of 4) LTG-1-C

PROJECT NAME		DATE
PROJECT ADDRESS		Building Permit
PRINCIPAL DESIGNER-LIGHTING	TELEPHONE	
DOCUMENTATION AUTHOR	TELEPHONE	Checked by/Date Enforcement Agency Use

GENERAL INFORMATION

DATE OF PLANS		BUILDING CONDITIONED FLOOR AREA		CLIMATE ZONE	

BUILDING TYPE	☐ NONRESIDENTIAL ☐ HIGH RISE RESIDENTIAL	☐ HOTEL/MOTEL GUEST
☐ CONDITIONED SPACES	☐ UNCONDITIONED SPACES ☐ INDOOR / OUTDOOR SIGNS	
PHASE OF CONSTRUCTION	☐ NEW ☐ ADDITION ☐ ALTERATION	

METHOD OF COMPLIANCE

☐ PERFORMANCE ☐ COMPLETE BUILDING ☐ AREA CATEGORY ☐ TAILORED ☐ COMMON LIGHTING

STATEMENT OF COMPLIANCE

This Certificate of Compliance lists the building features and performance specifications need to comply with Title 24, Parts 1 and 6 of the California Code of Regulations. This certificate applies only to building lighting requirements.

The documentation preparer hereby certifies that the documentation is accurate and complete.

DOCUMENTATION AUTHOR	SIGNATURE	DATE

The Principal Lighting Designer hereby certifies that the proposed building design represented in this set of construction documents is consistent with the other compliance forms and worksheets, with the specifications, and with any other calculations submitted with this permit application. The proposed building has been designed to meet lighting requirements contained in applicable parts of Sections 110, 119,130–132, 146, 148, & 149 of Title 24, Part 6.

☐ The plans & specifications meet the requirements of Part 6 (Sections 10-103a). ☐ The installation certificates meet the requirements of Part 6 (10-103a 3).

☐ The operation & maintenance information meet the requirements of Part 6 (10-103c).
Please check one: (These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for its preparation; and that I am licensed in the State of California as a civil engineer or electrical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code by section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under Division 3 of the Business and Professions Code to sign this document because it pertains to a structure or type of work described as exempt pursuant to Business and Professions Code Sections 5537, 5538 and 6737.1.

PRINCIPAL LIGHTING DESIGNER-NAME	SIGNATURE	DATE	LIC. #

LIGHTING MANDATORY MEASURES

✓ ☐ Indicate location on plans of Note Block for Mandatory Measure _____

LIGHTING COMPLAINCE FORMS & WORKSHEETS (check box if worksheet is included)

☐ LTG-1-C, Parts 1 of 4 and 2 of 4	Certificate of Compliance. Part 1 of 4 and 2 of 4 are required for all submittals
☐ LTG-1-C, Part 3 of 4	Certificate of Compliance. Part 3 of 4 submittal is required only if Control Credits are claimed
☐ LTG-1-C, Part 4 of 4	Certificate of Compliance. Part 4 of 4 submittal is required when lighting controls are installed
☐ LTG-2-C	Indoor Lighting Schedule
☐ LTG-3-C	Portable Lighting Worksheet
☐ LTG-4-C	Lighting Controls Credit Worksheet
☐ LTG-5-C	Indoor Lighting Power Allowance
☐ LTG-6-C	Tailored Method Worksheet
☐ LTG-7-C	Room Cavity Ratio Worksheet
☐ LTG-8-C	Common Lighting Systems Method Worksheet
☐ LTG-9-C	Line Voltage Track Lighting Worksheet
☐ OLTG-4-C	Signs (See OLTG-4-C Sign Worksheet in Chapter 6, Outdoor Lighting and Signs Chapter)

CERTIFICATE OF COMPLIANCE (Part 2 of 4) LTG-1-C

PROJECT NAME DATE

INSTALLED INDOOR LIGHTING POWER FOR CONDITIONED AND UNCONDITIONED SPACES

	INSTALLED WATTS
INSTALLED LIGHTING, CONDITIONED SPACES (From LTG-2-C)	
PORTABLE LIGHTING (From LTG-3-C)	+
LIGHITNG CONTROL CREDIT, CONDITIONED SPACES (From LTG-4-C)	-
CONDITIONED SPACE ADJUSTED INSTALLED LIGHTING POWER	=
INSTALLED LIGHTING, UNCONDITIONED SPACES (From LTG-2-C)	
LIGHITNG CONTROL CREDIT, UNCONDITIONED SPACES (From LTG-4-C)	-
UNCONDITIONED SPACE ADJUSTED INSTALLED LIGHTING POWER	=

ALLOWED INDOOR LIGHTING POWER FOR CONDITIONED SPACES

✓

☐ **COMPLETE BUILDING METHOD (from LTG-5-C)**

☐ **AREA CATEGORY METHOD (from LTG-5-C)**

☐ **TAILORED METHOD (from LTG-5-C)**

	ALLOWED WATTS
ALLOWED LIGHTING POWER	

ALTERNATE COMPLIANCE

✓

☐ **PERFORMANCE METHOD**

☐ **COMMON LIGHTING SYSTEM (from LTG-8-C)**

ALLOWED INDOOR LIGHTING POWER FOR UNCONDITIONED SPACES (From LTG-5-C) _____ Watts

MANDATORY LIGHTING MEASURES FOR INDOOR LIGHTING AND DAYLIT AREAS

MANDATORY INDOOR AND DAYLIGHTING AUTOMATIC CONTROLS

CONTROL LOCATION (Room #, Area #, or Description)	CONTROL IDENTIFICATION	CONTROL TYPE (Auto Time Switch, Dimmimg, Photosensor, etc.)	SPACE CONTROLLED Lists the location of controlled lights	✓ If Control is for Daylighting	NOTE TO FIELD

INDOOR LIGHTING SCHEDULE (Part 1 of 2) LTG-2-C

PROJECT NAME	DATE

INSTALLED LIGHTING POWER FOR CONDITIONED SPACES

Luminaire		Lamps/Ballasts				Installed Watts			
A	B	C	D	E	F	G	H	I	J
Name	Type Description	Lamp Type	Number of Lamps per Luminaire	Watts Per Lamp	Number of Ballast per Luminaire	Watts per Luminaire	If ✓ CEC Default	Number of Luminaires	Installed Watts (G x I)

PAGE TOTAL	
BUILDING TOTAL (sum of all pages)	+
PORTABLE LIGHTING (From LTG-3-C)	+
CONTROL CREDIT (from LTG-4-C)	-
ADJUSTED ACTUAL WATTS	=

INDOOR LIGHTING SCHEDULE (Part 2 of 2) LTG-2-C

PROJECT NAME	DATE

INSTALLED LIGHTING POWER FOR UNCONDITIONED SPACES

Luminaire		Lamps/Ballasts				Installed Watts			
A	B	C	D	E	F	G	H	I	J
Name	Type Description	Lamp Type	Number of Lamps per Luminaire	Watts Per Lamp	Number of Ballast per Luminaire	Watts per Luminaire	If ✓ CEC Default	Number of Luminaires	Installed Watts (G x I)

BUILDING TOTAL (sum of all pages)	+
CONTROL CREDIT (from LTG-4-C	+
ADJUSTED ACTUAL WATTS	+

LIGHTING CONTROLS CREDIT WORKSHEET (Part 1 of 2) LTG-4-C

CONTROL CREDITS FOR CONDITIONED SPACES

PROJECT NAME	DATE

A	B	C	D	E	F	G	H	I	J
				YLIGHTING					
ROOM #, ZONE ID CONDITIONED AREAS	LIGHTING CONTROL DESCRIPTION	PLAN REFEFERENCE	ROOM AREA (ft^2)	WINDOW WALL RATIO	GLAZING VLT	SKYLIGHT EFFECTIVE APERTURE[1]	WATTS OF CONTROL LIGHTING	LIGHTING ADJUSTMENT FACTOR[2]	CONTROL CREDIT WATTS (H X I)

1) From Equation 146-A
2) From Table 146-A

PAGE TOTAL →	
BUILDING TOTAL →	

Enter in LTG-2-C: Lighting Control Credit

LIGHTING CONTROLS CREDIT WORKSHEET (Part 2 of 2) LTG-4-C

CONTROL CREDITS FOR UNCONDITIONED SPACES

PROJECT NAME	DATE

A	B	C	D	E	F	G	H	I	J
				DAYLIGHTING					
ROOM # ZONE ID UNCONDITIONED AREAS	LIGHTING CONTROL DESCRIPTION	PLANS REFERENCE	ROOM AREA (ft^2)	WINDOW WALL RATIO	GLAZING VLT	SKYLIGHT EFFECT. APERTURE[1]	WATTS OF CONTROL LIGHTING	LIGHTING ADJUSTMENT FACTOR[2]	CONTROL CREDIT WATTS (H X I)

1) From Equation 146-A
2) From Table 146-A

PAGE TOTAL →	
BUILDING TOTAL →	

Enter in LTG-2-C: Lighting Control Credit

INDOOR LIGHTING POWER ALLOWANCE LTG-5-C

PROJECT NAME	DATE

ALLOWED LIGHTING POWER (Choose One Method)

COMPLETE BUILDING METHOD– CONDITIONED SPACES

BUILDING CATEGORY (From § 146 Table 146-B)	**WATTS PER** (ft^2)	**COMPLETE BLDG. AREA**	**ALLOWED WATTS**

AREA CATEGORY METHOD – CONDITIONED SPACES

A	B	C	D
AREA CATEGORY (From § 146 Table 146-C)	**WATTS PER** (ft^2)	**AREA** (ft^2)	**ALLOWED WATTS**
	TOTALS	AREA	WATTS

TAILORED METHOD– CONDITIONED SPACES

TOTAL ALLOWED WATTS (From **LTG-6-C**)

UNCONDITIONED SPACES

A	B	C	D
Complete Building and Area Category Methods CATEGORY (From § 146 Table 146-B & C)	**WATTS PER** (ft^2)	**AREA** (ft^2)	**ALLOWED WATTS**
	TOTALS	AREA	WATTS

TAILORED METHOD– UNCONDITIONED SPACES

TOTAL **UNCONDITIONED SPACES** ALLOWED WATTS (From LTG-5-C and LTG-6-C)

COMMON LIGHTING SYSTEMS METHOD LTG-8-C

PROJECT NAME	DATE

The Common Lighting Systems method is only appropriate for Building Types listed in Table 146-B (Area Catagory Method Lighting Power Density Values) where the lighting power density is 1.0 Watts per square foot or greater.

SPACE NAME	SPACE AREA	LUMINAIRE TYPE OR CODE	LUMINAIRE POWER	CEC DEFAULT[1]? Y	CEC DEFAULT[1]? N	LUMINAIRE SPACING OR LAYOUT
				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	
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				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	

1) CEC default value from Nonresidential ACM Manual Appendix NB.

LINE VOLTAGE TRACK LIGHTING WORKSHEET LTG-9-C

PROJECT NAME	DATE

✓ ☐ METHOD 1 – VOLT-AMPERE (VA) RATING OF THE BRANCH CIRCUIT(S) OR WATTAGE OF THE CURRENT LIMITERS - ONLY CURRENT LIMITERS CERTIFIED TO THE COMMISSION CAN BE WITH THIS METHOD

A	B	C	D	E	F	G
Branch Circuit Option		Current Limiter Option				
BRANCH CIRCUIT NAME OR ID	VOLT-AMPERE (VA) RATING OF THE BRANCH CIRCUIT (Fill this column only if branch circuit option is used for compliance)	TRACK EQUIPPED WITH CURRENT LIMITER (CL)? (Columns C thru G may be left blank if the branch circuit option is used for compliance) ✓ IF YES	IF COLUMN (C) IS YES, LIST CURRENT LIMITER WATTAGE (W)	TRACK LENGTH (FT)	MULTIPLY TRACK LENGTH (E) BY 15 W/LF IF THERE IS CL, OR 45 W/LF IF THERE IS NO CL (W)	TRACK WATTAGE – HIGHER OF COLUMNS (D) OR (F) (W)
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
		☐				
		☐				
		☐				
		☐				
		☐				
SUB-TOTAL WATTS FOR TRACKS ON BRACH CIRCUIT – USE COLUMN (B) VA IF BRANCH CIRCUIT METHOD IS USED, OR TOTAL OF TRACK WATTS IN COLUMN (G) IF THE CL METHOD IS USED						
TOTAL WATTS – ADD ALL SUBTOTALS						

✓ ☐ METHOD 2 – USE THE HIGHER OF: 45 WATTS / LINEAR FOOT OF TRACK – OR TOTAL RATED WATTAGE OF ALL OF ALL LUMINAIRES

A	B	C	D	E	F
TRACK # OR NAME	LINEAR FEET OF TRACK	(W/LF)	B x C (W)	TOTAL RATED WATTAGE OF ALL LUMINAIRES	LARGER OF (D or E)
		45			
		45			
		45			
		45			
		45			
		45			
				TOTAL	

Mechanical Forms - Compliance

CERTIFICATE OF COMPLIANCE (Part 1 of 3) MECH-1-C

PROJECT NAME		DATE
PROJECT ADDRESS		Building Permit
PRINCIPAL DESIGNER-MECHANICAL	TELEPHONE	
DOCUMENTATION AUTHOR	TELEPHONE	Checked by/Date Enforcement Agency Use

GENERAL INFORMATION

DATE OF PLANS	BUILDING CONDITIONED FLOOR AREA	CLIMATE ZONE

BUILDING TYPE ☐ NONRESIDENTIAL ☐ HIGH RISE RESIDENTIAL ☐ HOTEL/MOTEL GUEST ROOM

PHASE OF CONSTRUCTION ☐ NEW CONSTRUCTION ☐ ADDITION ☐ ALTERATION ☐ UNCONDITIONED (file affidavit)

PROOF OF ENVELOPE COMPLIANCE ☐ PREVIOUS ENVELOPE PERMIT ☐ ENVELOPE COMPLIANCE ATTACHED

STATEMENT OF COMPLIANCE

This Certificate of Compliance lists the building features and performance specifications needed to comply with Title 24, Parts 1 and 6 of the California Code of Regulations. This certificate applies only to building mechanical requirements.

The documentation preparer hereby certifies that the documentation is accurate and complete.

DOCUMENTATION AUTHOR	SIGNATURE	DATE

The Principal Mechanical Designer hereby certifies that the proposed building design represented in this set of construction documents is consistent with the other compliance forms and worksheets, with the specifications, and with any other calculations submitted with this permit application. The proposed building has been designed to meet the mechanical requirements contained in the applicable parts of Sections 100, 101, 102, 110 through 115, 120 through 125, 142, 144 and 145.

✓

☐ The plans & specifications meet the requirements of Part 6 (Sections 10-103a).

☐ The installation certificates meet the requirements of Part 6 (10-103a 3).

☐ The operation & maintenance information meets the requirements of Part 6 (10-103c).

Please check one: (These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for its preparation; and that I am licensed in the State of California as a civil engineer or mechanical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code by Section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code to sign this document because it pertains to a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

PRINCIPAL MECHANICAL DESIGNER-NAME	SIGNATURE	DATE	LIC. #

INSTRUCTIONS TO APPLICANT MECHANICAL COMPLIANCE & WORKSHEETS (check box if worksheet is included)

☐ MECH-1-C	Certificate of Compliance. Part 1 of 3, 2 of 3, 3 of 3 are required on plans for all submittals
☐ MECH-2-C	Certificate of Compliance. Part 1 of 3, 2 of 3, 3 of 3 are required for all submittals, but may be on plans.
☐ MECH-3-C	Certificate of Compliance are required for all submittals with mechanical ventilation, but may be on plans.
☐ MECH-4-C	Certificate of Compliance are required for all prescriptive submittals, but may be on plans.

HVAC MISC. PRESCRIPTIVE REQUIREMENTS: MECH-4-C

PROJECT NAME	DATE

FAN POWER CONSUMPTION §144(c)

NOTE: Provide one copy of this worksheet for each fan system with a total fan system horsepower greater than 25 hp for Constant Volume Fan Systems or Variable Air Volume (VAV) Systems when using the Prescriptive Approach.

A	B	C	D	E	F
FAN DESCRIPTION	**DESIGN BRAKE HP**	**EFFICIENCY**		**NUMBER OF FANS**	**PEAK WATTS** B x E x 746 / (C x D)
		MOTOR	**DRIVE**		

FILTER PRESSURE ADJUSTMENT Equation. 144-A

A) If filter pressure drop is greater than 1 inch W. C. enter filter pressure drop. SP_a on line 4 and Total Fan pressure SP_f on Line 5.

B) Calculate Fan Adjustment and enter on line 6.

C) Calculate Adjusted Fan Power Index and enter on Row 7

1) TOTAL FAN SYSTEM POWER (WATTS, SUM COLUMN F)	
2) SUPPLY DESIGN AIRFLOW (CFM)	
3) TOTAL FAN SYSTEM POWER INDEX (Row 1 / Row 2)[1]	W/CFM
4) SP_a	
5) SP_f	
6) Fan Adjustment = $1-(SP_a - 1)/SP_f$	
7) ADJUSTED FAN POWER INDEX (Line 3 x Line 6)[1]	W/CFM

1. TOTAL FAN SYSTEM POWER INDEX or ADJUSTED FAN POWER INDEX must not exceed 0.8 w/cfm, for Constant Volume systems or 1.25 w/cfm for VAV systems

ITEM or SYSTEM TAG(S)				
PRESCRIPTIVE MEASURES	***T-24 Section***	**Capacity**	**Exception**	***Notes***
Electric Resistance Heating[1]	§144 (g)			
Heat Rejection System[2]	§144 (h)			
Air Cooled Chiller Limitation[3]	§144 (I)			

1. Total installed capacity (MBtu/hr) of all electric heat on this project exclusive of electric auxiliary heat for heat pumps. If electric heat is used explain which exception(s) to §144(g) apply.

2. Are centrifugal fan cooling towers used on this project? (Enter “Yes” or “No”) If centrifugal fan cooling towers are used explain which exception(s) to §144(h) apply.

3. Total installed capacity (tons) of all chillers and air cooled chillers under this permit, If there are more than 100 tons of air-cooled chiller capacity being installed explain which exception(s) to §144(i) apply.

LIGHTING COMPLIANCE SUMMARY (Part 3 of 4) OLTG-2-C

PROJECT NAME | DATE

Lighting Power Allowance for Specific Applications (TABLE 147-B) – Other Than Vehicle Service Station without Canopies

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Allotted Watts			Luminaire Description			Lamps/Ballasts				Design Watts				
Lighting Application (Table 147-B)	Area (ft^2) or Length (LF)	Allotted LPD W/ft^2 or W/LF	Allotted Watts (B X C)	Code for Luminaire Type	Description	Cutoff Designation	Lamp Type	Number of Lamps per Luminaire	Watts per Lamp	Number of Ballast per Luminaire	Watts per Luminaire	✓ If CEC Default	Number of Luminaires	Design Watts (L x N)	Allowed Watts Minimum of (D or O)

LIGHTING COMPLIANCE SUMMARY (Part 4 of 4) OLTG-2-C

PROJECT NAME	DATE

Lighting Power Allowance for Vehicle Service Station without Canopies

Allotted Watts				Luminaire			Lamps / Ballasts				Design Watts				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Number Single or Double Sided Fuel Dispensers	Area Single = 250 ft² Double = 500 ft²	Allotted LPD W/ft²	Allotted Watts (A x B x C)	Code for Luminaire Type	Description	Cutoff Designation	Lamp Type	Number of Lamps per Luminaire	Watts per Lamp	Number of Ballast per Luminaire	Watts per Luminaire	✓ If CEC Default	Number or Luminaires	Design Watts (L x N)	Allowed Watts Minimum of (D or O)

ILLUMINATED AREA CALCULATION WORKSHEET (Part 2 of 5) OLTG-3-C

PROJECT NAME	DATE

A. Hardscape Method ii

Hardscape for driveways, site roads, sidewalks, walkways and bikeways -

A	B
List Specific Application (Table 147-A)	Length of 25' wide path incorporating as much of the paved area as possible.

Checklist

☐ § 147(c)1 B – Each portion of all illuminated areas has been assigned only one lighting application, and the applications are consistent with the actual use of the areas.

☐ § 147(c)1 B Method ii – General illumination areas for site roadway, driveway, sidewalk, walkway, or bikeway includes only those illuminated areas that are in the bounds of the Application and includes a 25 foot wide area running along the axis of the path of travel and includes as much of the paved area as possible.

B. Building Entrances without Canopies

A	B	C
Width of Door plus 3 feet	Smaller of 18 feet or distance to the edge of the property line	Area (A x B) (ft^2)

Checklist

☐ § 147(c)1 B – Each portion of all illuminated areas has been assigned only one lighting application, and the applications are consistent with the actual use of the areas.

☐ § 147(c)1 A - General illumination areas includes only those illuminated areas that are in the bounds of the Application and are within a square pattern around a luminaire that is six times the luminaire mounting height, with the luminaire in the middle of the pattern, less any areas that are within buildings, under canopies, beyond property lines, or obstructed by a signs or other structures.

2005 CERTIFICATE OF ACCEPTANCE (Part 1 of 2) LTG-1-A

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	Checked by/Date Enforcement Agency Use

GENERAL INFORMATION

DATE OF BLDG. PERMIT	PERMIT #	BLDG. CONDITIONED FLOOR AREA	CLIMATE ZONE

BUILDING TYPE	☐ NONRESIDENTIAL	☐ HIGH RISE RESIDENTIAL	☐ HOTEL/MOTEL GUEST ROOM
PHASE OF CONSTRUCTION	☐ NEW CONSTRUCTION	☐ ADDITION ☐ ALTERATION	☐ UNCONDITIONED

STATEMENT OF ACCEPTANCE

This Certificate of Acceptance summarizes the results of the acceptance tests related to building lighting requirements per Title 24, Part 6. (Sections 119(d), 119(e), 131(d))

Please check one:

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for it's preparation; and that I am licensed in the State of California as a civil engineer or electrical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code by Section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under the exemption to Division 3 of the business and Professions Code to sign this document because it pertains to a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

(These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

TESTING AUTHORITY - NAME	SIGNATURE	DATE	LIC.#

INSTRUCTIONS TO APPLICANT

For Detailed instructions on the use of this and all Energy efficiency Standards acceptance forms, please refer to the Residential Manual published by the California Energy Commission.

Part 1 of 2 - Statement of Acceptance

Part 2 of 2 - Summary of Acceptance Tests

2005 CERTIFICATE OF ACCEPTANCE (Part 2 of 2) LTG-1-A

PROJECT NAME	DATE

SUMMARY OF ACCEPTANCE TESTS

SYSTEM ACCEPTANCE DOCUMENT Form____of ____)	TESTING AUTHORITY	DATE OF TEST	PASS / FAIL	NOTES Bldg. Dept. Use

NOTE: Use additional sheets as necessary

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Lighting Control Acceptance Document LTG-2-A

Form __ of __

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
LIGHTING CONTROL SYSTEM NAME / DESIGNATION		Checked by/Date Enforcement Agency Use

Intent: Lights are turned off when not needed per 119(d) & 131(d).

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Light meter
   b. Hand-held amperage and voltage meter
   c. Power meter

2 Occupancy Sensor Construction Inspection
   ☐ Occupancy sensor has been located to minimize false signals
   ☐ Occupancy sensors do not encounter any obstructions that could adversely effect desired performance
   ☐ Ultrasonic occupancy sensors do not emit audible sound (119a) 5 feet from source

3 Manual Daylighting Controls Construction Inspection
   ☐ If dimming ballasts are specified for light fixtures within the daylit area, make sure they meet all the Standards requirements, including "reduced flicker operation" for manual dimming control systems

4 Automatic Time Switch Controls Construction Inspection
   a. Automatic time switch control is programmed for (check all):
      ☐ Weekdays
      ☐ Weekend
      ☐ Holidays
   b. Document for the owner automatic time switch programming (check all):
      ☐ Weekdays settings
      ☐ Weekend settings
      ☐ Holidays settings
      ☐ Set-up settings
      ☐ Preference program setting
   ☐ Verify the correct time and date is properly set in the time switch
   ☐ Verify the battery is installed and energized
   ☐ Override time limit is no more than 2 hours

Certification Statement: I certify that all statements are true on this LTG-2-A form including the PASS/FAIL Evaluation.

I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form LTG-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

:

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Automatic Daylighting Controls Acceptance Document — LTG-3-A

Form __ of __

PROJECT NAME		DATE
PROJECT ADDRESS		Checked by/Date Enforcement Agency Use
TESTING AUTHORITY	TELEPHONE	
AUTOMATIC DAYLIGHTING CONTROL NAME / DESIGNATION		

Intent: Verify operation of daylighting systems meet 119(e)2.

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Light meter
   b. Hand-held amperage and voltage meter
   c. Power meter

2 Documentation of all control devices (photocells) have been properly located including:
   a. Factory-calibrated (proof required)
      ☐ Factory-calibration certificate attached
   b. Field-calibrated
      ☐ Setpoint properly set
      ☐ Lighting threshold

3 Documentation has been provided by the installer for:
   ☐ Setpoints for each device
   ☐ Settings for each device
   ☐ Programming for each device

4 Luminaires controlled by automatic daylighting controls are only in daylit areas; and
   ☐ Separately circuited for daylit areas by windows and daylit areas under skylights

Certification Statement: I certify that all statements are true on this LTG-3-A form including the PASS/FAIL Evaluation.

I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form LTG-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

2005 CERTIFICATE OF ACCEPTANCE (Part 1 of 2) MECH-1-A

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	Checked by/Date Enforcement Agency Use

GENERAL INFORMATION

DATE OF BLDG. PERMIT	PERMIT #	BLDG. CONDITIONED FLOOR AREA	CLIMATE ZONE

BUILDING TYPE	☐ NONRESIDENTIAL	☐ HIGH RISE RESIDENTIAL	☐ HOTEL/MOTEL GUEST ROOM	
PHASE OF CONSTRUCTION	☐ NEW CONSTRUCTION	☐ ADDITION	☐ ALTERATION	☐ UNCONDITIONED

STATEMENT OF ACCEPTANCE

This Certificate of Acceptance summarizes the results of the acceptance tests related to building mechanical requirements per Title 24, Part 6. (Sections 10-103.b, 121.f, 122.h, 125.a, 125.b, 125.c, 125.c.5, 125.d)

Please check one:

☐ I hereby affirm that I am eligible under the provisions of Division 3 of the Business and Professions Code to sign this document as the person responsible for it's preparation; and that I am licensed in the State of California as a civil engineer or mechanical engineer, or I am a licensed architect.

☐ I affirm that I am eligible under the exemption to Division 3 of the Business and Professions Code by Section 5537.2 or 6737.3 to sign this document as the person responsible for its preparation; and that I am a licensed contractor performing this work.

☐ I affirm that I am eligible under the exemption to Division 3 of the business and Professions Code to sign this document because it pertains to a structure or type of work described pursuant to Business and Professions Code sections 5537, 5538, and 6737.1.

(These sections of the Business and Professions Code are printed in full in the Nonresidential Manual.)

TESTING AUTHORITY - NAME	SIGNATURE	DATE	LIC.#

INSTRUCTIONS TO APPLICANT

For Detailed instructions on the use of this and all Energy efficiency Standards acceptance forms, please refer to the Nonresidential Manual published by the California Energy Commission.

Part 1 of 2 - Statement of Acceptance

Part 2 of 2 - Summary of Acceptance Tests

2005 CERTIFICATE OF ACCEPTANCE (Part 2 of 2) MECH-1-A

PROJECT NAME	DATE

SUMMARY OF ACCEPTANCE TESTS

SYSTEM ACCEPTANCE DOCUMENT (Form ____ of _____)	TESTING AUTHORITY	DATE OF TEST	PASS / FAIL	NOTES Bldg. Dept. Use

NOTE: Use additional sheets as necessary

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Ventilation System Acceptance Document — MECH-2-A

NJ.3.1, NJ.3.2 — Form 1 of 2 __

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
VENTILATION SYSTEM NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify measured outside airflow CFM is within ± 10% of the total required outside airflow value found in the Standards Mechanical Plan (MECH-3, Column I), per 121(f).

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Watch
   b. Means to measure airflow (hot wire anemometer or pitot tube)

2 Check one of the following:

☐ Variable Air Volume (VAV) - Check as appropriate:
   a. Sensor used to control outdoor air flow must have calibration certificate or be field calibrated
      ☐ Calibration certificate (attach calibration certification)
      ☐ Field calibration (attach results)

☐ Constant Air Volume (CAV) - Check as appropriate:
   ☐ System is designed to provide a fixed minimum OSA when the unit is on

Certification Statement: I certify that all statements are true on this MECH-2-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

: _ _

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Ventilation System Acceptance Document — MECH-2-A

NJ.3.1, NJ.3.2 — Form 2 of 2_

PROJECT NAME	DATE

A.	Equipment Testing	CAV	VAV
a.	Constant or Variable Air Volume (CAV or VAV) - check appropriate column		
b.	Verify unit is not in economizer mode during test - check appropriate column		
Step 1: CAV and VAV testing at full supply airflow			
1	Drive boxes open (check)		
2	Measured outdoor airflow (cfm)		
3	Required outdoor airflow (cfm) *(from MECH-3, column I)*		
4	Time for outside air damper to stabilize after VAV boxes open (minutes)		
5	Return to initial conditions (check)		
Step 2: VAV testing at reduced supply airflow			
1	Drive boxes to minimum (check)		
2	Measured outdoor airflow (cfm)		
3	Required outdoor airflow (cfm) *(from MECH-3, column I)*		
4	Time for outside air damper to stabilize after VAV boxes open (minutes)		
5	Return to initial conditions (check)		

B. Testing Calculations & Results	CAV	VAV
Step 1: % Outdoor Air = Measured outside air /Required outside air (Step1:2/Step1:3)	%	%
90%< %Outdoor Air > 110% to 90% = %Outoor Air = 110%	Y / N	Y / N
Outside air damper position stabilizes within 15 minutes (Step 1:4 < 15 minutes)	Y / N	Y / N
Step 2: % Outdoor Air = Measured outside air /Required outside air (Step2:2/Step2:3)		
90%< %Outdoor Air > 110% to 90% = %Outdoor Air = 110%		Y / N
Outside air damper position stabilizes within 15 minutes (Step 2:4 < 15 minutes)		Y / N

Note: Shaded areas do not apply for particular test procedure

C.	PASS / FAIL Evaluation (check one):
☐	PASS: All **Construction Inspection** responses are complete and **Testing Calculations & Results** responses are positive (Y - yes)
☐	FAIL: Any **Construction Inspection** responses are incomplete *OR* there is one or more negative (N - no) responses in **Testing Calculations & Results** section. Provide explanation below. Use and attach additional pages if necessary.

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Packaged HVAC Systems Acceptance Document — MECH-3-A

NJ.4.1 — **Form __ of __**

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
PACKAGED HVAC NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify that under a specific load whether in occupied or unoccupied condition, the system meets a specific sequence of operation.

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. None required

2 Installation
   ☐ Thermostat or zone temperature sensor is located within the zone that the HVAC system serves
   ☐ Thermostat or sensor is wired to the HVAC system correctly

3 Programming (check **all** of the following)
   ☐ Heating and cooling thermostats are capable of a 5°F deadband where cooling and heating are at a minimum (§122b3)
   ☐ Occupied, unoccupied, and holiday schedule have been programmed.
   ☐ Pre-occupancy purge (at least lesser of minimum outside air or 3 ACH for one hour prior to occupancy) programmed (§121.c.2)
   ☐ Set up and set back setpoints have been programmed as required

Certification Statement: I certify that all statements are true on this MECH-3-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

: _ _

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Economizer Acceptance Document — MECH-4-A

NJ.7.1 — **Form __ of __**

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
AIR ECONOMIZER NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify that an HVAC system uses outside air to satisfy space cooling loads when outside air conditions are acceptable.

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Hand-held temperature probes
   b. Multi-meter capable of measuring ohms and milliamps

2 Test method (check one of the following):

☐ Economizer comes from HVAC system manufacturer installed by and has been factory calibrated and tested. **Attach documentation and complete certification statement. No equipment testing required.**

☐ Economizer field installed and field tested.

3 Installation (check **all** of the following first level boxes)

☐ Economizer high limit setpoint complies with Table 144-C per Standards Section 144(e)3

☐ System controls are wired correctly to ensure economizer is fully integrated (i.e. economizer will operate when mechanical cooling is enabled), if all boxes are checked for Standalone Control or EMS Control

Stand-alone Control Systems:

- ☐ HVAC unit has two-stage thermostat and the economizer is wired to be the first stage of control
- ☐ First stage of cooling (Y1) from thermostat is separately wired to Y1 at HVAC unit
- ☐ Second stage of cooling (Y2) from thermostat is separately wired to Y2 at HVAC unit
- ☐ Two stages of cooling are not jumpered or wired together

EMS Controlled Systems:

- ☐ Control sequence of operations will allow economizer to be integrated with cooling coil

☐ Economizer high limit control sensor(s) are properly installed

☐ System is provided with either barometric relief or powered relief (a relief fan or a return fan)

☐ Sensor(s) used for economizer high limit control has factory calibration certificate or is field calibrated. Sensors include: outside air sensor only if single-point changeover; both outside and return air sensors if differential changeover control. Field calibration is not necessary if economizer is factory installed.

Certification Statement: I certify that all statements are true on this MECH-4-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date _____

:

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE MECH-5-A

NJ.5.1Air Distribution Acceptance Document (Part 1 of 3)

PROJECT NAME	DATE	TELEPHONE
PROJECT ADDRESS		
TESTING AUTHORITY		
AIR DISTRIBUTOR NAME / DESIGNATION	PERMIT NUMBER	_____ Checked by/Date Enforcement Agency Use

Intent:	New single zone supply ductwork shall not exceed a 6% leakage rate per §144(k) or §149Di, existing single zone ductwork shall not exceed 15% leakage or other compliance path per §149Dii or §149E.

Construction Inspection

1 Scope of test – New Buildings – this test required on New Buildings only if all checkboxes 1(a) through 1(c) are checked

Existing Buildings – this test required if 1(a) through 1(d) are checked

Ductwork conforms to the following (note if any of these are not checked, then this test is not required):

- ☐ 1a) Connected to a constant volume, single zone air conditioners, heat pumps, or furnaces
- ☐ 1b) Serves less than 5000 square feet of floor area
- ☐ 1c) Has more than 25% duct surface area located in one or more of the following spaces
  - Outdoors
  - A space directly under a roof where the U-factor of the roof is greater than U-factor of the ceiling
  - A space directly under a roof with fixed vents or openings to the outside or unconditioned spaces
  - An unconditioned crawlspace
  - Other unconditioned spaces
- ☐ 1d) A duct is extended or any of the following replaced: air handler, outdoor condensing unit of a split system, cooling or heating coil, or the furnace heat exchanger.

2 Instrumentation to perform includes:

a. Duct Blaster

3 Material and Installation. Complying new duct systems shall have a checked box for all of the following categories a through f.

a. Choice of drawbands (check one of the following)

- ☐ Stainless steel worm-drive hose clamps
- ☐ UV-resistant nylon duct ties
- ☐ b. Flexible ducts are not constricted in any way
- ☐ c. Duct leakage tests performed before access to ductwork and connections are blocked
- ☐ d. Joints and seams are not sealed with cloth back rubber adhesive tape unless used in combination with Mastic and drawbands
- ☐ e. Duct R-values are verified R-8 per 124(a)
- ☐ f. Ductwork located outdoors has insulation that is protected from damage and suitable for outdoor service

Certification Statement

I certify that all statements are true on this MECH-5-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name:		
Company:		
Signature:		Date:

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Demand Control Ventilation Acceptance Document — MECH-6-A

NJ.8.1 — Form __ of __

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
DCV NAME / DESIGNATION		_____ Checked by/Date Enforcement Agency Use

Intent: Verify outside air ventilation flow rate can be modulated automatically based on maintaining interior carbon dioxide concentration setpoint.

Construction Inspection

1 Instrumentation to perform test may include, but not limited to:
   a. Calibrated hand-held CO2 analyzer
   b. Manufacturer's calibration kit
   c. Calibrated CO2/air mixtures

2 Installation
   ☐ The sensor is located in the room between 1 ft and 6 ft above the floor
   ☐ System controls are wired correctly to ensure proper control of outdoor air damper system

3 Documentation of all carbon dioxide control sensors includes (check one of the following):
   a. Calibration method
      ☐ Factory-calibration certificate
      ☐ Field calibrated
   b. Sensor accuracy
      ☐ Certified by manufacturer to be no more than +/- 75 ppm

Certification Statement: I certify that all statements are true on this MECH-6-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

-:

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Supply Fan VFD Acceptance Document — MECH-7-A

NJ.9.1 — **Form __ of __**

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	_____ Checked by/Date Enforcement Agency Use
VFD NAME / DESIGNATION		

Intent: Verify that the supply fan in a variable air volume application modulates to meet air flow demand and operating parameters are within +/-10% of design value and/or setpoint.

Construction Inspection

1 Instrumentation to perform test includes, but not limited to:
   a. Differential pressure gauge

2 Test preparation
   ☐ Disable discharge air temperature reset sequences to prevent unwanted interaction while performing tests

3 Documentation of all discharge static pressure sensors including (check one of the following):
   a. Factory-calibrated (proof required)
      ☐ Factory-calibration certificate
   b. Field-calibrated
      ☐ Calibration complete, all pressure sensors within 10% of calibrated reference sensor

Certification Statement: I certify that all statements are true on this MECH-7-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

::

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — Form 1 of 4

PROJECT NAME		DATE
PROJECT ADDRESS		
TESTING AUTHORITY	TELEPHONE	
HYDRONIC SYSTEM NAME / DESIGNATION		Checked by/Date Enforcement Agency Use

Intent: Satisfy HVAC water pumping requirements per Section 144(j).

Construction Inspection

1 Instrumentation to perform tests include, but not limited to:
   a. Differential pressure gauge
   b. Portable temperature probe

2 Variable Flow Controls (VFC) and Automatic Isolation Controls (AIC) Inspection

VFC AIC

☐ ☐ Valve and piping arrangements were installed per the design drawings to achieve the desired control

3 Supply Water Temperature Reset Controls Inspection

☐ Supply temperature sensors have been calibrated
   ☐ Manufacturer's calibration certificates (attached)
   ☐ Site calibration within 2° F of temperature measurement with reference meter

☐ Sensor locations are adequate to achieve accurate measurements

☐ Installed sensors comply with specifications

4 Water-loop Heat Pump Controls Inspection

☐ Valves were installed per the design drawings to achieve equipment isolation requirements

☐ All sensor locations comply with design drawings

5 Variable Frequency Drive Controls Inspection

☐ All valves, sensors, and equipment were installed per the design drawings

☐ Pressure sensors are calibrated
   ☐ Manufacturer's calibration certificates (attached)
   ☐ Site calibration within 10% of pressure measurement with reference meter

Certification Statement: I certify that all statements are true on this MECH-8-A form including the PASS/FAIL Evaluation. I affirm I am eligible to sign this form under the provisions described in the Statement of Acceptance on form MECH-1-A

Name: _____

Company: _____

Signature: _____ Date: _____

::

2005 ACCEPTANCE REQUIREMENTS FOR CODE COMPLIANCE

Hydronic System Control Acceptance Document — MECH-8-A

NJ.10.1 - NJ.10.5 — Form 2 of 4

PROJECT NAME	DATE

			System ID				
A.	**System Type**	**1**	**2**	**3**	**4**	**5**
	1 Chilled water					
	2 Heating hot water					
	3 Water-loop heat pump loop					
	4 Other (fill in blank):					
	5 Other (fill in blank):					
B.	**Select Acceptance Test (check all tests completed)**	**1**	**2**	**3**	**4**	**5**
☐	Variable Flow Control - Alternate 1 (Flow measurement)					
☐	Variable Flow Control - Alternate 2 (No flow measurement)					
☐	Automatic Isolation Controls					
☐	Supply Water Temperature Reset Controls					
☐	Water-loop Heat Pump Controls - Alternate 1 (With Flow Meter)					
☐	Water-loop Heat Pump Controls - Alternate 2 (Without Flow Meter)					
☐	(Pump) Variable Frequency Drive Controls - Alternate 1(With Flow Meter)					
☐	(Pump) Variable Frequency Drive Controls - Alternate 2(Without Flow Meter)					

		System ID				
C.	**Equipment Testing Requirements**					
	Verify and document the following (check applicable tests)	**1**	**2**	**3**	**4**	**5**
	NJ 10.1 Variable Flow Control - Alternate 1					
	Step 1: Open all control valves.					
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	System operation achieves design conditions	☐	☐	☐	☐	☐
	Step 2: Initiate closure of control valves					
a.	Measured system flow (gpm) GPM =					
b.	Design system flow (gpm) GPM =					
c.	Design pump flow control strategy achieves flow reduction requirements	☐	☐	☐	☐	☐
d.	Ensure all valves operate correctly against the system pressure	☐	☐	☐	☐	☐
	Step 3: System returned to initial operating conditions	Y / N	Y / N	Y / N	Y / N	Y / N
	NJ.10.1 Variable Flow Control- Alternate 2					
	Step 1:Drive all valves shut and dead head pump against manual isolation valve					
a.	Measured pressure across the pump (ft. H20) ΔP=					
	Step 2: Open manual isolation valve and measure pump DP with control valves closed					
a.	Measured pressure across the pump (ft. H20) ΔP=					
b.	Both shutoff pressures are within +/- 5% of each other	☐	☐	☐	☐	☐
	Step 3: System returned to initial operating conditions	Y / N	Y / N	Y / N	Y / N	Y / N
	NJ.10.2 Automatic Isolation Controls					
	Step 1:Drive all valves shut and dead head pump against manual isolation valve					
a.	Measured pressure across the pump (ft. H20) ΔP=					
	Step 2: Open manual isolation valve and start/stop each chiller or boiler one at a time					
a.	Verify automatic isolation valve opens fully when respective unit is ON	☐	☐	☐	☐	☐
b.	Verify automatic isolation valve closes fully when respective unit is OFF	☐	☐	☐	☐	☐
	Step 3: Stop all chillers and boilers on the hydronic loop					
a.	Measured pressure across the pump (ft. H20) ΔP=					
b.	Both shutoff pressures (1a and 3a) are within +/- 5% of each other	☐	☐	☐	☐	☐
	Step 4: System returned to initial operating conditions	Y / N	Y / N	Y / N	Y / N	Y / N

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PROJECT NAME			DATE				
NJ.10.3 Supply Water Temperature Reset Controls							
Step 1: Manually change design control variable to maximum setpoint							
a.	Reset temperature setpoint	°F =					
b.	Measured water temperature	°F =					
c.	Water temperature setpoint is reset to appropriate value		☐	☐	☐	☐	☐
d.	Actual water supply temperature meets setpoint		☐	☐	☐	☐	☐
Step 2: Manually change design control variable to minimum setpoint							
a.	Reset temperature setpoint	°F =					
b.	Measured water temperature	°F =					
c.	Water temperature setpoint is reset to appropriate value		☐	☐	☐	☐	☐
d.	Actual water supply temperature meets setpoint		☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions			Y / N	Y / N	Y / N	Y / N	Y / N
NJ 10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 1							
Step 1: Open all control valves							
a.	Measured system flow (gpm)	GPM =					
b.	Design system flow (gpm)	GPM =					
c.	System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.)		☐	☐	☐	☐	☐
Step 2: Initiate shut-down sequence on each individual heat pumps							
a.	Isolation valves close automatically upon unit shut-down		☐	☐	☐	☐	☐
b.	Ensure all valves operate correctly at shut-off system pressure conditions		☐	☐	☐	☐	☐
c.	System flow reduced for each individual heat pump shut down		☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions			Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.4 Water-loop Heat Pump Controls (for circulation pumps > 5 hp) - Alternate 2							
Step 1:Drive all valves shut and dead head pump against manual isolation valve							
a.	Measured pressure across the pump (ft. H20)	ΔP=					
Step 2: Open manual isolation valve and measure pump DP with automatic isolation valves closed							
a.	Measured pressure across the pump (ft. H20)	ΔP=					
b.	Both shutoff pressures are within +/- 5% of each other		☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions			Y / N	Y / N	Y / N	Y / N	Y / N
NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 1							
Step 1: Open all control valves							
a.	Measured system flow (gpm)	GPM =					
b.	Design system flow (gpm)	GPM =					
c.	Design pump power (estimated by motor HP/ motor efficiency x 0.746 kW/HP)	kW =					
d.	System operation achieves design conditions +/- 5% (Step 1.a./Step 1.b.)		☐	☐	☐	☐	☐
e.	VFD operates near 100% speed at full flow		☐	☐	☐	☐	☐
Step 2: Modulate control valves closed							
a.	Ensure all valves operate correctly at system pressure conditions		☐	☐	☐	☐	☐
b.	Witness proper response from VFD (speed decreases as valves close)		☐	☐	☐	☐	☐
c.	Time for system to stabilize	Min =					
d.	System operation stabilizes within 5 min. after test procedures are initiated		☐	☐	☐	☐	☐
Step 3: Adjust system operation to achieve 50% flow							
a.	Measured system flow (gpm)	GPM =					
b.	Measured pump power at full flow	kW =					
c.	%Power = part load kW/full load design kW (Step 3.b. / Step 1.c.)	% =					
d.	VFD input power less than 30% of design		☐	☐	☐	☐	☐
Step 4: Adjust to achieve flow rate where VFD is below min speed setpoint							
a.	VFD minimum setpoint	Hz =					
b.	Ensure VFD maintains minimum speed setpoint		☐	☐	☐	☐	☐
Step 5: System returned to initial operating conditions			Y / N	Y / N	Y / N	Y / N	Y / N

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PROJECT NAME	DATE

NJ.10.5 (Pump) Variable Frequency Drive Controls - Alternate 2						
Step 1: Open all control valves						
a.	Visually inspect a few valves to verify that they open					
b.	Time for system to stabilize Min =					
c.	System operation stabilizes within 5 min. after test procedures are initiated	☐	☐	☐	☐	☐
d.	VFD operates near 100% speed at full flow	☐	☐	☐	☐	☐
e.	Measured pressure at loop pressure sensor control point *(psi or ft WC)*					
Step 2: Modulate control valves closed						
a.	Visually inspect a few valves to verify that they close	☐	☐	☐	☐	☐
b.	Witness proper response from VFD (speed decreases as valves close)	☐	☐	☐	☐	☐
c.	Time for system to stabilize Min =					
d.	System operation stabilizes within 5 min. after test procedures are initiated	☐	☐	☐	☐	☐
e.	Measured pressure at loop pressure sensor control point *(psi or ft WC)*					
f.	Measured pressure with valves closed ≤ pressure with valves open	☐	☐	☐	☐	☐
Step 3: System returned to initial operating conditions		Y / N	Y / N	Y / N	Y / N	Y / N

D. PASS / FAIL Evaluation (check one):

☐ PASS: All applicable **Construction Inspection** responses are complete and applicable **Equipment Testing Requirements** check boxes are compete.

☐ FAIL: Any applicable **Construction Inspection** responses are incomplete *OR* there is one or more unchecked box for an applicable test in the **Equipment Testing Requirements** section. Provide explanation below. Use and attach additional pages if necessary.